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Popular Woodworking

Issue #81 November 1994

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see page 8

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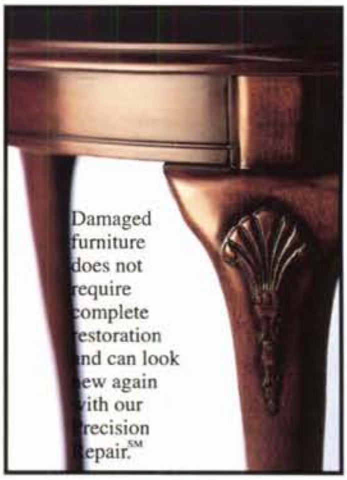
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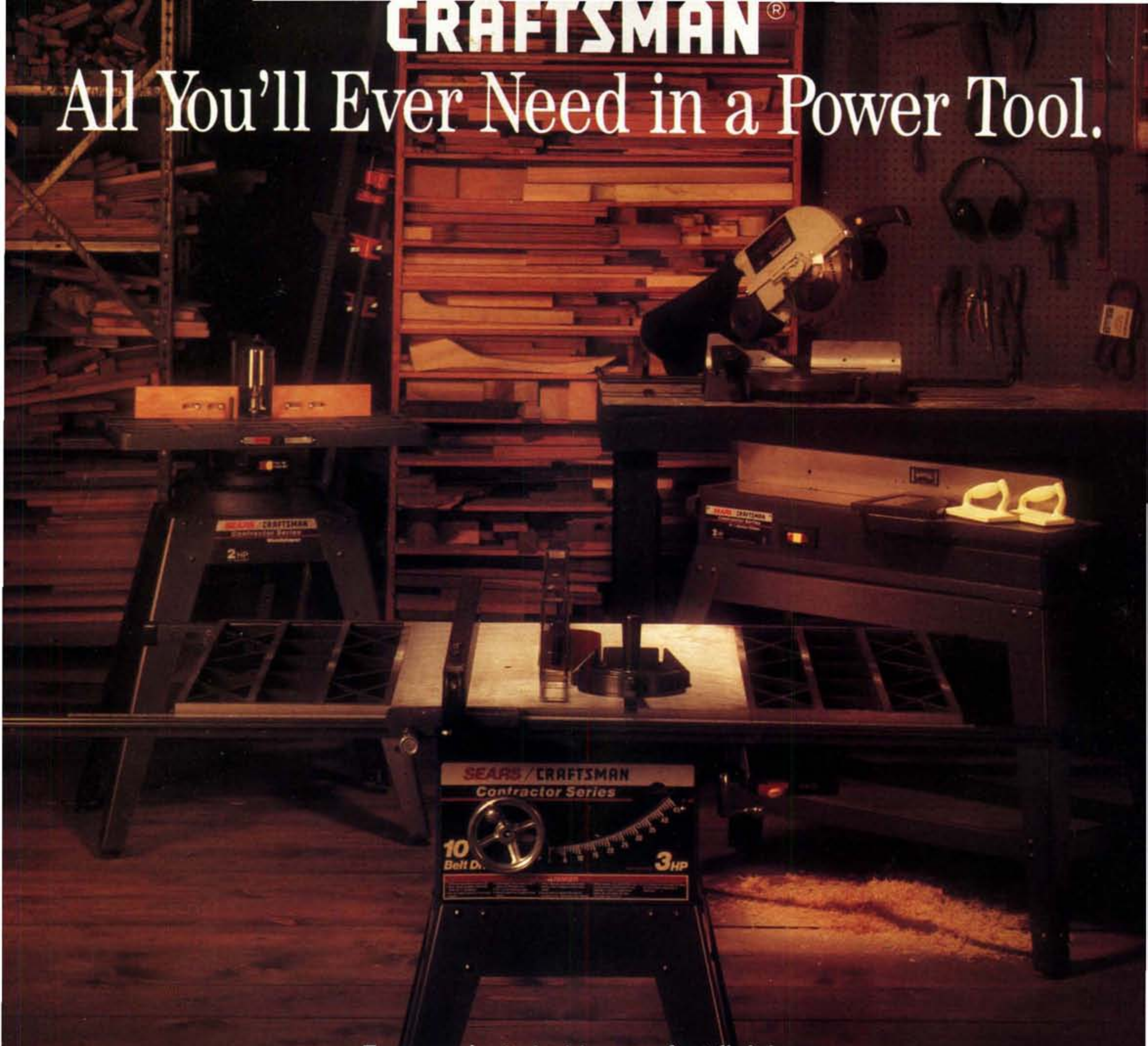

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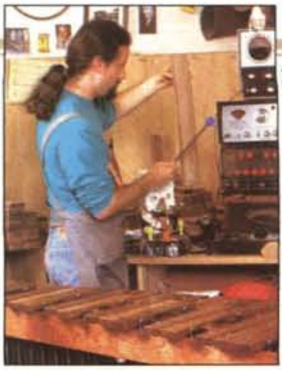
On the Cover

Ron Samuels of Arcata, California builds marimbas for a living. His instruments can be found in concert halls around the world. Here Ron is tuning one of the sixty–one tone bars that go into a five octave marimba. The electronics not only help ensure the accuracy of the fundamental tone, but assist Ron in tuning for the second and third harmonics as well. The "pet skull" on the table holds the microphones that pick up the sound when the tone bar is struck.



Cover: J. Patrick Cudahy, Arcata, CA

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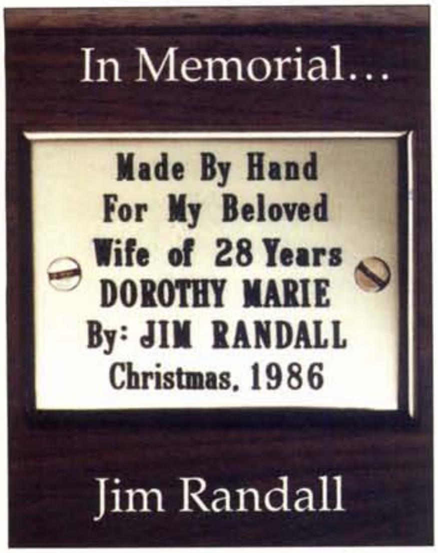
Turnings



In Memorial…

Made By Hand
For My Beloved
Wife of 28 Years
DOROTHY MARIE
By: JIM RANDALL
Christmas, 1986

Jim Randall

The plaque above appears on the inside of a Chest for Silver Flatware built by Jim Randall of Kent, Connecticut. This is a lovely cabinet for the storage of fine silverware. The construction article begins on page 70.

Jim and his wife Dorothy visited the San Francisco Bay Area in early July. Jim took the train out to our offices to see how we put the magazine together and discuss a possible project. We spent some time in the shop, and then I showed him how the pages all go together on the computer. We had lunch and instantly hit it off together.

On August 10th, I received a note from Dorothy informing us that Jim had passed away on July 18th on the twentieth lap of his swimming workout.

I will certainly miss my new found friend. Our deepest sympathies go out to the Randall family and friends.

Jim's spirit will continue to live in the memories of those he loved and in the beautiful works he created.

Rob

Letters

We welcome your comments, pro or con, about articles we publish. We also want to see color pictures of what you're building. Send your letters and photos to: Editor, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207. Letters may be edited for publication.

Kit Furniture

I have a problem that perhaps your readers can help me with. Years ago a company by the name of Bedford Lumber sold cedar chest kits along with other kit furniture. I can't find the address or even if they're still in business.

Can anyone give me the address of this company or any other that makes cedar chest kits?

Dale Hunt
New Salem, ND 58563

Let the Chips Fly

It was with wide–eyed interest that I read in your July issue the article entitled "Chip Carving," written by Jack Ekstrom. Beside providing the reader with doubtful, inaccurate procedures and information, Mr. Ekstrom falls victim to an act of plagiarism. The beautiful two–headed eagle to which Mr. Ekstrom refers in his second paragraph attributed to "Indiana chip carver Al Schmutz," was lifted directly from page 75 of my book *Chip Carving Techniques and Patterns*, and page 84 of my book *Chip Carving Patterns*, both published by Sterling.

He goes on to report that this two–headed eagle is the symbol of reborn Russia. Rubbish. The truth is that the first book in which my design appears was published long before Russia was "reborn." In fact, this design is originally from the coat of arms of the House of Habsburg which ruled Austria for 1000 years and incorporated their family crest into the Austrian coat of arms. In light of these facts, it would be proper, and I would expect a correction in your next publication properly identifying and attributing the origins of this design and carving.

Without belaboring the point by enumerating other inefficiencies, inaccuracies and contradictions in Mr. Ekstrom's article, I suggest he would serve his readers by more thoroughly researching the topics about which he writes. I also suggest that your readership is entitled to, and deserves much better.

Wayne Barton
Park Ridge, Illinois

I certainly enjoyed getting your courteous, friendly letter; it was very good to hear from another carving writer.

Thank you for introducing me to your two excellent books on chip carving. I regret not having seen them before. Yes, your fine patterns of the two–headed eagle are very similar to the one I drew from Mr. Schmutz's carving. But please, sir, there is certainly no "plagiarism" involved; absolutely nothing of yours was copied, and my drawing differs from yours in many respects. Surely you're not claiming that Mr. Schmutz's carving is yours.

As a matter of fact, I thought Mr. Schmutz's carving, with its long, thin curves much more closely resembled the double–headed eagle motif of the Romanov Dynasty in Russia than the Hap(b)sburg motif from Austria. My comment about the two–headed eagle as the "symbol of reborn Russia" is hardly "rubbish" (to use your eloquent term), as the old Romanov motif is seen throughout Russia these days; there is a wide–spread movement, which probably will be unsuccessful, to reinstate it as an official symbol. In any event, the remark was intended only to put Mr. Schmutz's contemporary chip carving style (as compared to your traditional style) into a popular context.

Jack Ekstrom

Safety Note

Safety is your responsibility. The manufacturers place safety devices on their equipment for a reason. In most of the photos you see in *PW*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Please don't copy us. Think about each procedure you're going to perform beforehand. Think ahead.

Mousetrap Attribution?

You're not the first to attribute the "mousetrap" quote to Ralph Waldo Emerson (*PW*, September, 1994), but you are certainly the only one to do so for many, many years.

The "build a better mousetrap" saying was the work of Elbert Green Hubbard (1856-1915), founder of the Roycrofters in East Aurora, New York. Hubbard, who earned his place in the American literary pantheon for his "Message to Garcia," wrote and sold a series of "Little Journeys" to the homes of the late and great, and Emerson was one of them.

Hubbard, long on hot air and short on research, often made up things his famous subjects didn't say, but he wished they had. Thus, he caused Emerson to discuss the idea of building a better mousetrap. The *Literary Digest* uncovered the hoax about 1910, and Felix Shay told the entire story in his definitive Hubbard biography in 1928.

When confronted, Hubbard refused to take things seriously. No, he didn't want credit for what is probably the most famous quote in history, he said. Besides, he responded, "that mousetrap guff isn't true, anyway. The world will never beat a path to your door unless you advertise. It may also be well to have an automobile meet all trains and a free lunch served on the front porch." Wouldn't Hubbard's comments have made an even stronger start for your otherwise fine article?

I am curious as to where you found the "mousetrap" quote still attributed to Emerson. Certainly *Bartlett's Familiar*, the most famous of the various dictionaries of quotations, hasn't listed the quotation in years.

Those of us who enjoy woodworking are often tagged as both *unwashed* and *unread*. Won't you please correct your incorrect attribution in a future issue so that we are at least shed of the *unread* label?

Alan A. Wheeler
Fairfax, Virginia

I'm pleased that you liked my story despite your feeling that my opening statement was incorrect. What you have to say about the better mousetrap saying is interesting. My reference was The Oxford Dictionary of Quotations, *third edition, published 1979. In this book, the quotation is ascribed to Emerson with the following footnote;*

Mrs. Sarah S.B. Yule (1856-1916) credits the quotation to Emerson in her Borrowings *(1889), stating in* The Docket, *February 1912, that she copied this in her handbook from a lecture delivered by Emerson. The quotation was the occasion of a long controversy, owing to Elbert Hubbard's claim to its authorship.*

So you see, the controversy is still with us. I'm inclined to go with the Oxford Dictionary *and accept Mrs. Yule's statement. Using it as I did, makes a short, sharp and attention catching opening. It allows me to state in a few words, at the beginning, the gist of the entire story. It's not really important who said it, just that it was said, thus giving me a good contrast for my own comment "If you don't toot your own horn, no one will toot it for you." A statement I've found to be only too true.*

Ken Sadler

Resharpening Large Band Saw Blades

Several months ago I purchased a resaw bandsaw with a 3" stellite–tipped band saw blade. After resawing several hundred board feet the stellite tips lost their edge and proper set. There is no one in my area that resharpens these blades. Repurchasing new blades is a bit costly. Eventually, I discovered Automatic Saw and Tool Company, 1151 70th Street, North Bergen, NJ 07047. For a reasonable fee, they have satisfactorily resharpened and reset three blades for me. If you have a need to resharpen larger bandsaw blades, I recommend contacting Frank at 201-861-5050. The time to call is in the afternoon. Frank has been most accommodating to work with and quite professional in his workmanship.

Duane Koch
Lake Jackson, Texas

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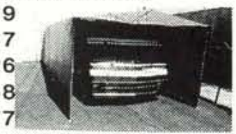

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Glass Cutter Dresses Grinding Wheel

I've found that small grinding wheels trued with a diamond dressing tool are often so smooth that they cause the work to overheat. Re-dress these small wheels with an old glass cutter of the free–rolling, steel–wheel type. Hold the glass cutter at a constant pressure against the tool rest and move it back and forth across the grinding wheel. The smooth surface of the grinding wheel will open up and provide much better results than if dressed with the diamond tool alone. Glass cutters that have become too dull for cutting glass are great for this purpose.

Howard E. Moody
Upper Jay, New York

Baking Soda Clean

I don't like to use scouring type hand cleaners to wash up. Woodworking is fairly clean and generally doesn't require such abrasive scrubbing. I use baking soda instead. I sprinkle a ¼ to ½ teaspoon into the liquid soap that I use. Baking soda has a fine, cleansing grit that cleans my hands and leaves them smelling fresh without the harsh abrasive action.

Lane Olinghouse
Everett, Washington

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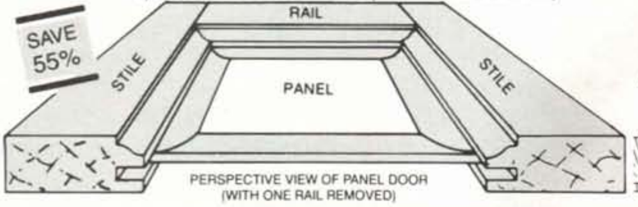
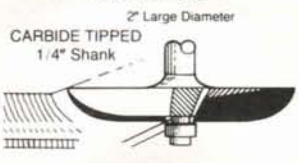


PERSPECTIVE VIEW OF PANEL DOOR (WITH ONE RAIL REMOVED)

RAISED PANEL BIT
SUPPLIED WITH
BALL BEARING



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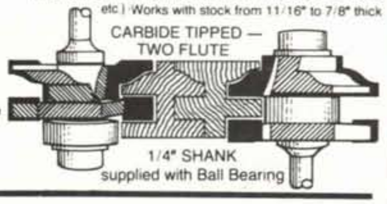

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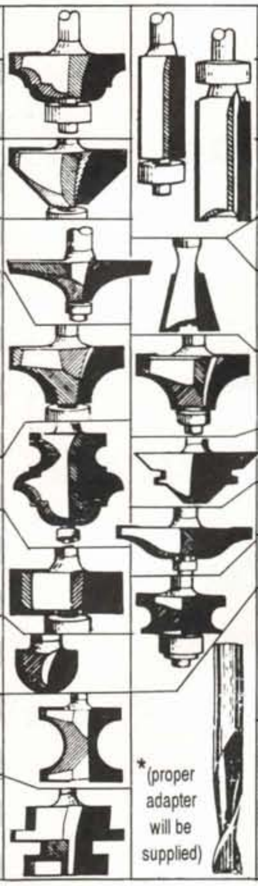
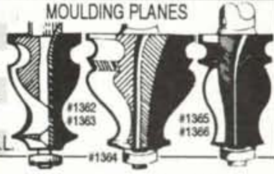
#1336	TONGUE & GROOVE - Wedge	1/2"	$29.00



*(proper adapter will be supplied)

ITEM NUMBER	DESCRIPTION (ALL 2 FLUTE)	SHANK SIZE	PRICE
#1337	FLUSH TRIM - 3/8" Diameter — 1" Cutting Length	1/4"	$ 7.50
#1338	FLUSH TRIM - 1/2" Diameter — 1" Cutting Length	1/4"	$ 8.00
#1339	FLUSH TRIM - 1/2" Diameter — 1-3/16" Cut.Length	1/2"	$ 8.00
#1340	PATTERN / FLUSH TRIM - 1/2" Diameter	1/4"	$15.00
#1341	PATTERN / FLUSH TRIM - 3/4" Diameter **NEW !**	1/4"	$17.00
#1342	PATTERN / FLUSH TRIM - 3/4" Diameter	1/2"	$19.00
#1343	KEYHOLE CUTTER - 3/8" (bit not	1/4"	$ 8.50
#1344	KEYHOLE CUTTER - 1/2" shown)	1/4"	$ 9.00
#1345	DOVETAIL (HSS) - 1/4" Diameter — 7-1/2°	1/4"	$ 6.50
#1346	DOVETAIL - 1/2" Diameter — 14° **NEW !**	1/4"	$ 6.00
#1347	DOVETAIL - 1/2" Diameter — 14°	1/2"	$ 6.50
#1348	BEADING - 1/4" Radius	1/4"	$13.00
#1349	BEADING - 3/8" Radius	1/4"	$15.50
#1350	BEADING - 1/2" Radius	1/4"	$17.00
#1351	LOCKMITRE - 7/8" Cutting Length **NEW !**	1/4"	$32.00
#1352	LOCKMITRE - 1-1/8" Cutting Length	1/2"	$45.00
#1353	OGEE RAISED PANEL - 2" Large Diameter	1/4"	$28.00
#1354	OGEE RAISED PANEL - 2-3/4" Large Diameter	1/2"	$32.95
#1355	EDGE BEADING - 3/16" Diameter of Circle	1/4"	$15.00
#1356	EDGE BEADING - 5/16" Diameter of Circle	1/4"	$15.50
#1357	SPIRAL UPCUT - 1/8" Diameter (solid carbide)	1/4"*	$ 9.00
#1358	SPIRAL UPCUT - 1/4" Diameter (solid carbide)	1/4"	$12.00
#1359	SPIRAL UPCUT - 1/4" Diameter (solid carbide)	1/2"*	$12.00
#1360	SPIRAL UPCUT - 3/8" Diameter (solid carbide)	1/2"*	$24.00
#1361	SPIRAL UPCUT - 1/2" Diameter (solid carbide)	1/2"	$29.00
	MOULDING PLANES 		
#1362	1" C.L.	1/4"	$24.95
#1363	1-5/8" C.L.	1/2"	$29.95
#1364	1-5/8" C.L.	1/2"	$31.95
#1365	1" C.L.	1/4"	$31.95
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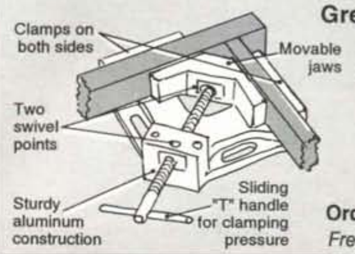
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Tricks of the Trade

Adhesive Bandages Prevent Marring

It's sometimes necessary to have a firm grip on polished tubing, wood turnings, or other work that requires additional clamping. Using regular pliers will usually mark or scratch the work. I've found that placing a plastic bandage over each jaw of the pliers will prevent most marring.

Howard E. Moody
Upper Jay, New York

Thinned Varnish Penetrates Better

Before applying varnish to finished furniture, I pour out enough for a first coat in a separate container and add thinner/turpentine or the varnish reducer recommended by the manufacturer. The thinned first coat penetrates the wood fibers, creates a better seal and gives a good bonding surface for the second coat—applied at normal consistency.

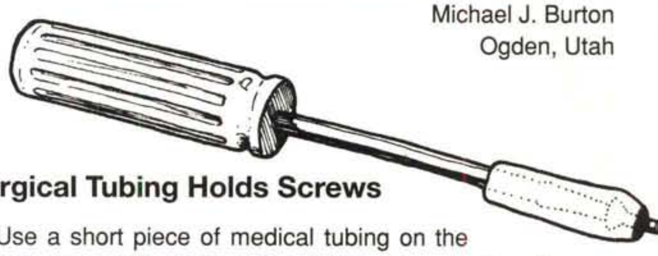
Lane Olinghouse
Everett, Washington

Salvage Warped Doors

Warped and twisted cabinet doors can often be salvaged. Place blocks or wedges under opposite corners and clamp the door to a piece of particle board or MDF to twist it slightly in the other direction. Wrap this assembly in black plastic and put it in the hot sun for about eight hours. The door is heated to about 150° and the twist removed. This doesn't damage the finish provided it's in good condition.

In the winter, the assembly may be placed over a steam radiator. Never use electric or combustion heaters as a source of heat. The same technique may be used to twist a door to fit a cabinet that was built a little out–of–square.

Michael J. Burton
Ogden, Utah



Surgical Tubing Holds Screws

Use a short piece of medical tubing on the end of a screwdriver shank to hold the screw for inserting into hard to reach places.

Norm Streit
Lancaster, New York

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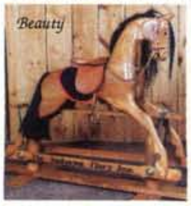

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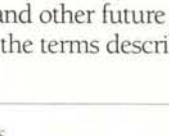

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Finishing Forum

by Dick Fitch

The Finishing Forum is an ongoing discussion about the art of wood finishing. If you have a question or a problem to solve, we'd like to help. If you have a tip or secret you'd like to share, or you recently tried a new product, write to: *Popular Woodworking*, c/o The Finishing Forum, 1507 Dana Ave., Cincinnati, OH 45207. Letters may be edited for publication.

Weathered Like an Old Barn

I am trying to imitate the effect of naturally weathered barn wood. Is there a quick distressing or aging method to accomplish a realistic weathered look?

Lynn Miner
Albuquerque, New Mexico

To the best of my knowledge, there is no magic potion that can quickly produce the effect of naturally weathered wood. To create a reasonably accurate imitation of natural barn board try this:

Do some physical distressing. Do any or all of the following—roughen the surfaces with course sandpaper—use a draw knife, hook scraper, putty knife or chisel to simulate some raked grain—create a few slick polished areas to vary color acceptance—round edges—worm holes, tool marks, color spots, blotches and stains are also sometimes effective—be innovative, but keep it believable. Now wet the wood with water to raise the grain and let it dry. Correct or smooth with steel wool, sandpaper or other tools areas that are too obviously over done.

If the wood is light—pine or birch, stain the wood with medium or dark brown color. Exposed wood naturally progresses from light to significantly darkening to surface delineation and finally to the dry, bleached, achromatic surface typical of weathered barn wood. Non grain–raising stains or water stains are convenient for initial staining.

There is no consistent color for all weathered wood. If possible use a piece of weathered wood of an acceptable color as a guide. Come up with a glaze of a proper color to produce the final surface for your faux weathered bard board. A glaze is a semi–transparent coating that you can apply with as much opacity or transparency as you want.

Oil base materials are best for this purpose because they allow more time for manipulation. Midtone base flat oil base works well. Remember you want some transparency. You may adjust opacity with matte varnish or solvent and varnish. Start with half of the indicated color addition if you are using machine colors.

Apply the glaze over a convenient area. Then with a cloth pad or brush remove part of the glaze as required. Wipe the cloth or brush dry each time you wipe so the implement can accomplish proper removal and/or leveling. Keep the glaze thin. If the area is not satisfactory wash it off with solvent. Allow the surface to dry and try again. if you want more opacity you may receipt when the surface is dry. Some practice on scraps is a definite aid to ultimate success.

Dick Fitch

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"My Woodshop Makes Me $300 a Week, Part Time. Yours Can, Too!"

by Rick Gundaker

You've heard of "the woodworker who was a real butcher."

It's true, for many years I was a meat cutter in a butcher shop in Erie, Pennsylvania. But several years ago the poor economy in the Erie area forced me to look for a new job.

After four long months, I found a new job, but it paid less and had fewer benefits. I desperately needed a second income.

I was sitting at the kitchen table very late one snowy night in December. I couldn't sleep, my checkbook was overdrawn, bills were piling up and the bank was threatening to foreclose on our home. Then it came to me.

For many years I had been making woodcrafts. I had made many unique items for our home. Everybody raved about them, so I started making them for gifts.

My wife, Amy, always said, "Rick, you should start selling your woodcrafts." But I would just laugh. Well, I wasn't laughing that night. Maybe Amy was right. Maybe I could sell them!

I took what little money we had, borrowed some from my Mom, and turned to my hobby with serious determination.

I started working three to four hours every day designing and making the same style woodcrafts my family and friends always raved about.

At first my income was small, $60.00 to $90.00 a week. But time and experience helped me develop some very successful selling methods, and my income grew beyond my greatest dreams.

You, too can make the extra money you need while enjoying your hobby. Using your basic woodworking skills, you can turn your woodshop into a money maker. I know it can be done because I did it, and I've helped many other woodworkers make money, too!

The following are excerpts from letters I've received from woodcrafters I've helped.

"You sure know what sells! The items I made from your plans have been on display at the local bank in St. Joseph. In less than 30 days I have sold $1,700 of my woodcrafts!! I'm enclosing a news story our local paper did on my work."

W.F.H. of St. Joseph, MN

"My wife is a school teacher. I made her one of your cute designs to set on her desk. Other teachers saw it and she sold eleven of them before the day was over. Keep up the good work."

C.M. of Baltimore, MD

"You're doing good. I've made several of your plans and the response to buy has been great. Every year I sell my crafts at our church fair and donate all the proceeds to the church. In 3 days I made over $600!"

C.R. of Chalmelle, LA

"Your patterns are simple and very easy to follow. I'm fairly new to woodworking and it's great to see full-size patterns with enough information so that even a beginner with limited woodworking knowledge can complete a project on their own. I'm really having fun with woodworking. Thanks for sharing your knowledge and experience, it's invaluable to the novice."

C.L. of Houston, TX

If these woodworkers can do it, you can, too!

There's plenty of room for everyone in woodcrafting. I won't be competing with you and you won't be competing with me. That's why I would enjoy showing you how you can start your own profitable craft business using your basic woodworking skills. You can go as far as you want... *profits are virtually unlimited!*

Here is what I'll send you:

I've put all my successful methods, plus 35 of my fastest selling designs, with step-by-step instructions into one fact-filled guide.

I'll show you...

*How to begin with a small amount of money.

*What tools you will need. I'll give you an exact list.

*What designs are the best sellers.

*What type of lumber and hardware to use and where to buy it.

*How to give your crafts that personal touch that will increase sales by 80%.

*How to avoid the mistakes that I made... and save hundreds of dollars.

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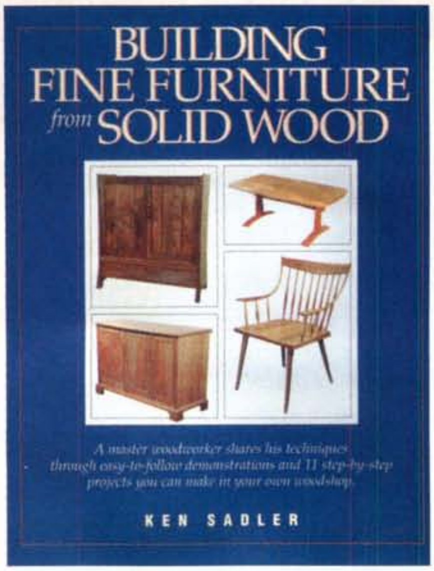
Book Reviews

by Hugh Foster


BUILDING FINE FURNITURE from SOLID WOOD
A master woodworker shares his techniques through easy-to-follow demonstrations and 11 step-by-step projects you can make in your own woodshop.
KEN SADLER

Building Fine Furniture from Solid Wood by Ken Sadler; Betterway Books, 1507 Dana Ave., Cincinnati, OH 45207; 154 pages, hard cover, $24.95.

Ken Sadler has been one of the guiding lights of the new *Popular Woodworking* for several years now. His five decades of woodworking experience make him an undoubted master. You've seen his projects in these pages, and you've read his observations about business and the people who make it their business.

Editor Rob Cook almost feels that we'd be patting ourselves on the back too much if we reviewed this book at all. I say, "That's bunk!" Sadler's book is masterful and beautifully done; and if you've enjoyed the small doses of his work that you've seen in the magazine, you're sure to love the massive dose provided in this handsome volume.

While he discusses nearly every possible aspect of woodworking in this volume, Sadler is careful to remind us that the difference is in the details, and that the details are really an individual thing. He states that he doubts that you can build "his" projects, and so do I. You'll have to make them your own.

That's precisely why I'll rate this as the best single, newly published book of projects I've seen this year. As you build your projects like his, you'll learn the elements of design, jig-making, wood and other materials selection, and how to make and use specific joints as you build the projects. For projects more elegant than most, you need look no farther than Ken Sadler's handsome new volume—this is a book that will be in use for many years to come by serious woodworkers who want to improve their skills. Highly recommended. PW

***Hugh Foster** is an English-teaching woodworker and author from Manitowoc, Wisconsin.*

The Woodworkers' Alphabet—"B"

Circle the words—they're horizontal, vertical and diagonal. The solution is on page 89

B	O	V	D	A	B	E	V	E	L	D
R	A	J	X	R	K	E	R	B	A	K
A	P	N	U	U	A	O	N	R	A	B
C	M	Z	D	R	I	O	B	C	O	J
K	Z	V	Q	I	G	A	B	C	H	T
E	R	A	B	E	N	Z	I	N	E	H
T	N	U	D	D	I	G	K	L	C	C
P	R	I	S	J	Y	K	S	R	U	E
R	B	A	B	S	D	O	I	Q	A	E
T	W	A	S	W	O	B	R	A	M	B
Z	O	K	A	J	B	B	R	A	C	E

Bandings—strips on inlay in various patterns
Bandsaw—endless bladed cutting machine for external shapes
Bark—outer covering of trees
Beech—hard, close-grained wood used mainly for chairs
Bench—work platform or seat
Benzine—used to remove oil and grease when varnishing
Bevel—an edge at other than a right angle
Bine—ridge or raised part of a twist turning
Birch—hardwood used mainly to make plywood
Board—softwood, >4" W x <2" T; hardwood, any width x <1¼" T
Bodying—the final stage in French polishing
Boss—decorative block covering the joint of two timbers
Bowsaw—a frame saw
Brace—used for boring with an auger
Bracket—a support
Brad—cut nail tapered in width but of equal thickness
Bruzze—used by wheelwrights to cut mortises in the nave
Burr—knot at the bottom of a tree where eyes form

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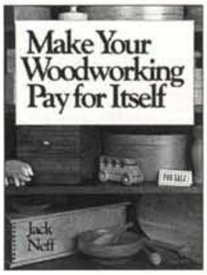

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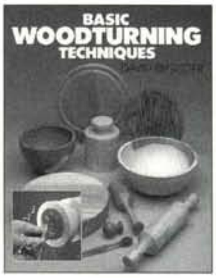

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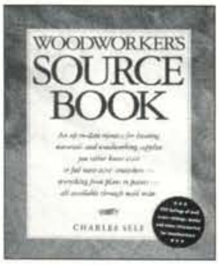

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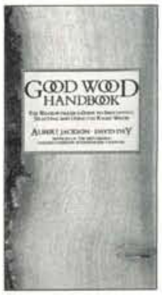

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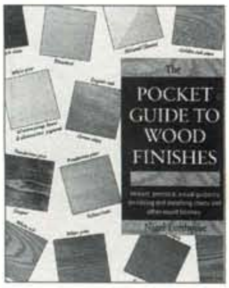

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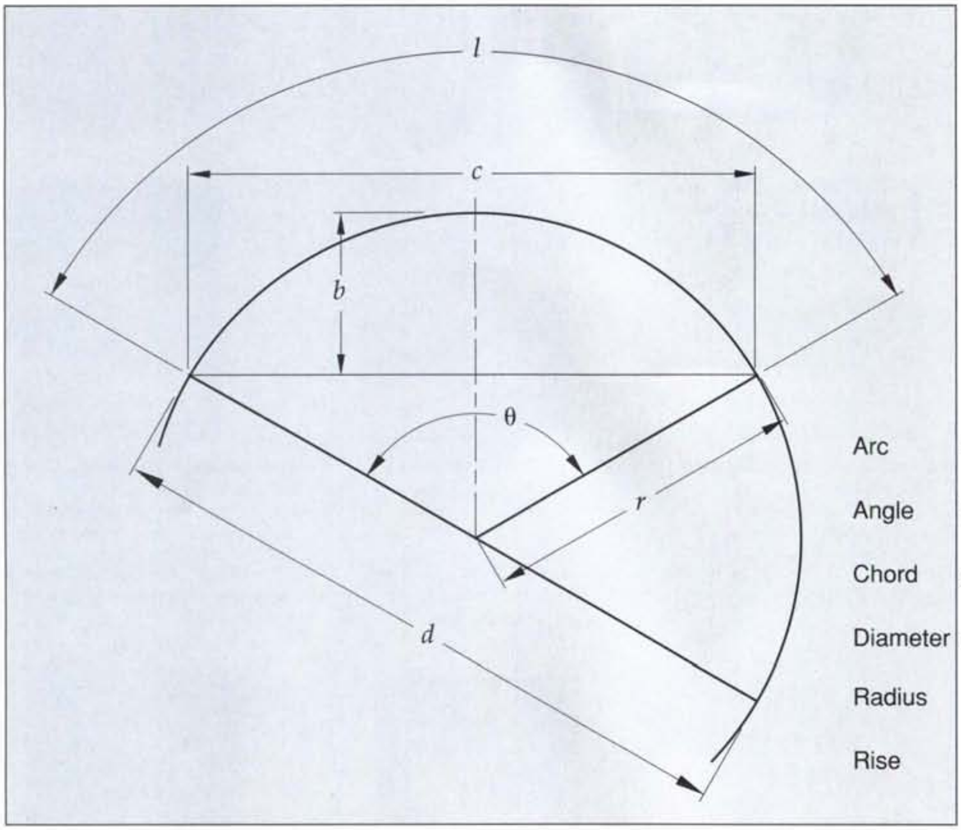
Mathematics
For The Woodworker
Part 4



Arc $l = \frac{\pi r \theta}{180} = .017453\ r\ \theta$

Angle $\theta = \frac{180°\ l}{\pi r} = 57.29578° \frac{l}{r}$

Chord $c = 2\sqrt{2br - b^2} = 2r \sin\frac{\theta}{2} = d \sin\frac{\theta}{2}$

Diameter $d = \frac{4b^2 + c^2}{4b}$

Radius $r = \frac{4b^2 + c^2}{8b}$

Rise $b = r - \frac{1}{2}\sqrt{4r^2 - c^2} = \frac{c}{2} \tan\frac{\theta}{4} = 2r \sin^2\frac{\theta}{4}$

Properties of the Circle

Circumference of a Circle of Diameter $1 = \pi = 3.14159265$
Circumference of a Circle $= 2\ \pi\ r = \pi\ d$
Diameter of a Circle = Circumference X 0.31831
Diameter of a Circle of equal periphery as a Square = Side X 1.27324
Side of a Square of equal periphery as a Circle = Diameter X 0.78540
Diameter of a Circle circumscribed about a Square = Side X 1.41421
Side of a Square inscribed in a Circle = Diameter X 0.70711

In the last article we worked with simple geometry formulas, emphasizing the entry method on my type of calculator. In this part we'll continue with entry examples but move on to formulas from the "Properties of the Circle." I think you'll find these more useful in day–to–day woodworking.

Let's take a look at the diagram from my engineering handbook. The picture is a circle segment with letters for dimensions which we'll substitute with values in the various formulas. '*l*' is the curved length of the outside of the segment. '*c*' is from the same points, but is a straight line and is called the chord. Other dimensions on the chord are '*b*', the rise, '*r*' for the radius and '*d*' is the diameter of the circle. The angle θ (Theta: pronounced Thay-tah) is the eighth letter or symbol in the Greek alphabet and is used to express angles in mathematical formulas.

The chord, c, can be any length from very small to the same as d, depending on the angle Theta, θ. Stated another way $c = d$ when $\theta = 180°$. In referring to this angle it is proper to say angle Theta as opposed to angle zero. The illustration is drawn as shown for clarity, but it can have any of the dimensions be any value.

Under the diagram are several conversion formulas of varying usefulness.

***Bob Calvert** is a retired tool designer and frequent contributor to* Popular Woodworking.

The first one describes Pi, π. If you have a circle with a diameter of one—this can be 1 inch, 1 foot or 1 mile — then the distance around the circumference is 3.141592654 (or more simply 3.1416) and has the same units of measure. The second one gives two formulas for the circumference of a circle. Let me point out right now that when you find the = sign between formulas, it's not all one formula. Each one is merely a boiled down version of the one preceeding it. You'll see this on many of the formulas listed below. Let's try both conversions on a 6" circle with $r = 3$ and $c = 6$—both answers equal 18.84955592.

The third conversion is a simple mathematical constant to derive the diameter from the circumference. Another more common way is to divide the circumference by Pi. This is handy when you want to find the diameter of a very large tree. Simply stretch a steel tape around the tree, measure and divide by Pi.

The next two have little use to us, but the last two are worth noting. The sixth conversion formula is for a circle drawn such that the line just sits on the corners of a square. The last one is for a circle that just touches the sides of the square—handy for fitting a square peg in a round hole or vice versa.

In working with the formulas given to the right of the diagram, let's use a 6" diameter circle divided into 7 segments. You'll notice that nearly all of the formulas use the value r or d. If you don't know these values for a given problem, then solving for r or d would first be necessary. More on this later.

The first formula to find the length of an arc is not used that much, but we will run through it for the exercise. First we need angle Theta, which for our sample is 360° ÷ 7 = 51.42857143° or 51° 25' 43"—remember the DMS button. We have then, $l = \pi r\theta/180$. To solve, press [2ndF] [EXP] [X] 3 [X] 51. 42857143 [=] [÷] 180 [=] 2.693. This number is the length of the chord. Using the shorter version of .017453 X r X θ will give you the same answer.

The next formula, to find Theta, is little used since you'll normally be dividing a circle into some desired number of segments. However, let's take a quick look. $\theta = 180° \, l/\pi r$ You can enter this by dividing 180 by Pi, then times l then divided by r, but I prefer to commit π r to memory as follows. [2ndF] [EXP] [X] 3 [=] [M+] [on/c] 180 [X] 2.693 [=] [÷] [RM] [=] [DMS]. The display now should read 51° 25' 57". The discrepancy in the seconds is due to rounding off the l value.

The next two formulas should prove very useful. I've often read about a pattern giving the dimensions for the chord, or circle segment as it's sometimes called, but no radius. Duplicating this becomes difficult since you're not given a setting for your beam compass. I have seen several methods of solving for r, but this is one of the simplest.

Since you most likely have been given b and c, it's very simple. Enter 8 [X] .297 [=] [M+] [on/c] 4 [X] .297 [x^2] [=] [+] 2.603 [x^2] [=] [÷] [RM] [=] 3.0001879. The diameter formula is nearly the same and enters as the above except for $4b$ in place of $8b$. The chord formulas are in my estimation the most useful.

I've read many solutions on how to divide a circle into a particular number of equal segments. Everything from complicated algebraic equations to simply laying a hex nut down on center and marking the corners. Both these methods have their problems—they're either too complicated or inaccurate. The hex of course is an old draftsman trick, yet easy to do with a compass, as mentioned in Part 1 of this article. But what about the 5, 7, or 9 equal divisions? Well, it's easy with this next formula and well worth writing down.

You'll note the addition of the words 'sin' and 'tan' in these next formulas. If you're not familiar with these terms let's just say for now that these are mathematical constants associated with angles and used in many formulas. We can use them since your calculator has them stored. See the [sin] [cos] [tan] buttons on your calculator? Since these terms refer to angles, you first need to enter the angle then press the function button. Otherwise the calculator doesn't know what you want the *sin*, *cos* or *tan* of. We'll use these more in the next and final part of this article. As mentioned above, we have several boiled–down formulas for the chord listed here. The last one is by far the easiest to use and remember: $c = d \sin \theta/2$. In using this formula, it's easy to read it wrong and enter the keystrokes incorrectly. At first glance you may think it is d times the sine of Theta divided by 2. Well it is and it isn't. You must divide Theta by 2 before entering the sine. If the formula wanted you to divide the sine of Theta by 2, it would be $\frac{d \sin \theta}{2}$. The incorrect entry method gives you an answer of 2.345—about ¼" error. Let's enter it correctly. 360 [÷] 7 [=] [÷] 2 [=] [sin] [X] 6 [=] 2.603. In a way, you perform this entry backwards since you need an angle before punching in the sine.

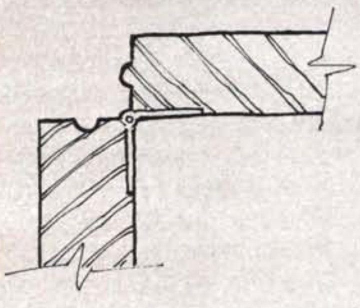
Let's do another since this is such a usable formula. Let's assume a diameter of 14.873" and go with 13 segments. Thus we have 360 [÷] 13 [=] [÷] 2 [=] [sin] [X] 14.873 [=] 3.559. Please try several more by varying the segments and the diameter, remembering chord lengths vary with diameter and quantity of segments.

To check your calculations, use a compass. Draw a circle, do the calculation, then set your compass to this number. Step off the circle. If the math was done in proper order and the compass set correctly, it will step off exactly to the prescribed number of segments.

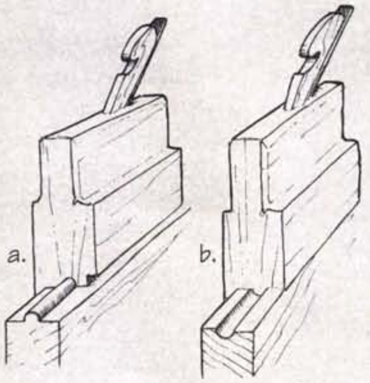
The last batch of formulas for the rise may be of some use. The final formula is done much like the chord. First divide angle Theta by 4 then enter [sin] [x^2] to square the sine before going on with the rest of the calculations.

Hinged Joints

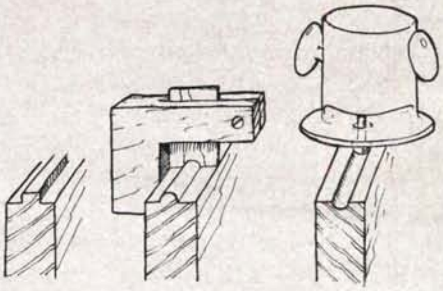
More on the rule joint: supporting it, fixing hinges, and other alternatives



beaded hinge joint



a. forming bead with astragal moulding plane
b. forming cove with fluting moulding plane



alternative methods of forming bead and cove

In the last issue I described how to make the rule joint by hand. This common joint, also known as a table joint, is used for joining the drop–leaves of drop–leaf tables to the main tabletop, as well as attaching the lids of fall–front desks to the desk itself. It is an elegant solution to this particular construction problem. The joint looks and works well and is not too hard to make, especially if you make your first attempts by hand following the instructions given in the last column. A few common hand tools make possible simple adjustments that can guarantee a satisfactory action.

Beaded Butt Joint

A simpler alternative to the rule joint is the beaded hinge joint. This consists of a simple square–edged butt joint with a bead formed in the tabletop edge and a matching cove formed in the drop–leaf edge. Although not *quite* as strong or as fancy as the fully formed rule joint, the bead still provides more support than a plain hinged butt joint. It also offers the advantage that when the leaf is in the open position nothing can fall through the joint.

The traditional way to form the bead and matching cove is with an astragal moulding plane and a matching fluting plane. But lacking these specialized moulding planes it is still a fairly easy matter to form the bead by cutting two rabbets and rounding the remaining central portion with a scratch stock, and to form the cove with an appropriately sized cove bit in a router.

Supporting Rule–Jointed Fall–Fronts

Once either joint has been made, it is necessary to devise some method for supporting the drop–leaf or fall–front when in the open position. There are various ways to do this so that not only will the leaf support whatever weight is put on it, but so that it will also open to just the right position—usually perfectly level with the main tabletop or interior of the desk.

One simple method that requires no extra joinery is to attach a pair of folding arms to the desk sides and the inside face of the fall–front. A stronger method, more usual when there are drawers beneath the desktop, consists in supporting the fall–front by means of a pair of slides that can be drawn out beneath the fall–front at each side. The slides are housed in the desk's carcass exactly like a drawer. In fact, they are most usually located at either side of a relatively shallow desk drawer located immediately below the level of the desk. Since the top edge of the slide runs against the underside of the desk top, there is usually no problem in keeping the opened fall–front perfectly co–planar with the desk top; its underside, when opened, similarly rests directly on the top of the slide.

Supporting Rule–Jointed Drop–Leaves

Since drop–leaves are operated from a hanging position upwards into a horizontal position—the reverse of fall–fronts, which work from the vertical, or nearly so, downward to a horizontal position—the use of folding metal arms is not a possibility. Supports housed under the tabletop are sometimes installed to slide out through the skirts and sup-

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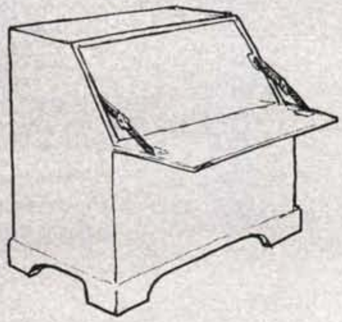
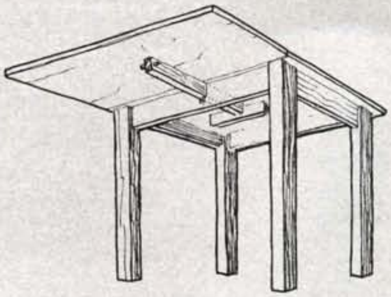
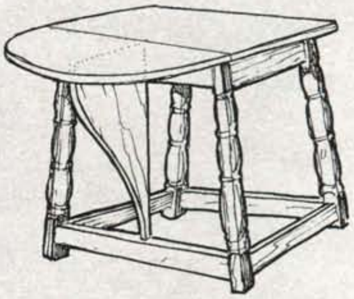
***Graham Blackburn**, a Contributing Editor to* Popular Woodworking, *knuckles under as a rule in Inverness, California.*



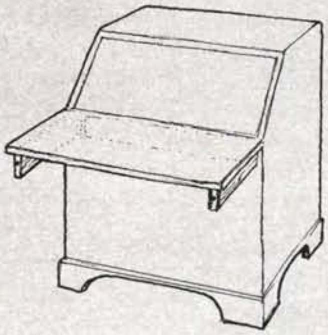
supporting fall-front
with folding arms



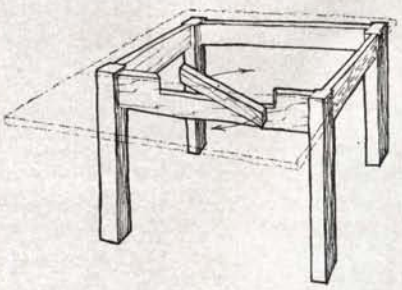
supporting drop-leaf
with slide



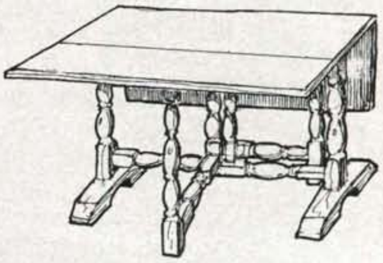
drop-leaf supported
by butterfly bracket



supporting fall-front
with slides



supporting drop leaf with
pivoting skirt section



gateleg support
system

port the drop–leaf. These require runners or additional parts to keep them aligned under the tabletop and may be limited in their length by the size of the tabletop.

Another extremely simple support for the drop–leaf may be made by making a portion of the skirt able to pivot so that when the leaf is raised a section of the skirt is swung out under the leaf. While very simple, this approach may also be limited by the width of the tabletop and will necessarily weaken the skirt support at the point it is made.

One of the more interesting methods of supporting a drop–leaf is the design known as a gateleg. Common on turned oak furniture, the gateleg swings out from the main leg and skirt substructure of the table in question to form not only positive support for the leaf, but an integral part of the overall design. Its only disadvantage, apart from its stylistic limitations if you try to design an unobtrusive gateleg, is that the opened gateleg can get in the way when sitting close.

A step in the right direction towards sufficient support and less leg obstruction was the invention of the butterfly bracket. This is a large, butterfly wing–shaped bracket pivoted between the skirt immediately under the tabletop and a rail connecting the lower ends of the legs. The design was common on furniture in colonial times, but for more refined and elegant furniture the butterfly bracket tends to be wasteful of wood and an obtrusive design feature.

The best solution involves a pivoting bracket, or pair of brackets, attached to the face of the skirt supporting the tabletop beneath the rule joint. The bracket, or brackets, can be designed to be totally inconspicuous when closed. Made from the same material as the skirt, and finished the same way, they can appear to be part of the skirt, if not the actual skirt itself. Their ends can be square or elegantly profiled, and their top surface can be precisely adjusted so that the drop–leaf can be supported perfectly level.

There is, of course, no reason why the ends of the brackets cannot support legs. In this manner the legs of the table can be swung out to support a drop–leaf; and, indeed, this was a common way of designing eighteenth– and nineteenth–century card tables, which were characterized by having only a single drop–leaf, supported, when raised, by knuckle–jointed legs swung out from a subskirt.

What makes these brackets possible is another form of hinged joint known as the knuckle joint. Like the common finger or box joint used to join the corners of boxes, the bracket is finished with a number of stubby "knuckles" that fit into a matching set formed on the fixed part of the bracket. But unlike the finger joint, the knuckles pivot on a wooden or metal pin inserted through their center.

Making the Knuckle Joint

The knuckle joint is easily made by hand and requires only a saw and chisel. Since the main prerequisite for a successful joint is to start with perfectly square and true stock, machinery such as the table saw and jointer may be used to good effect, but for the actual forming of the joint such machines are of limited use.

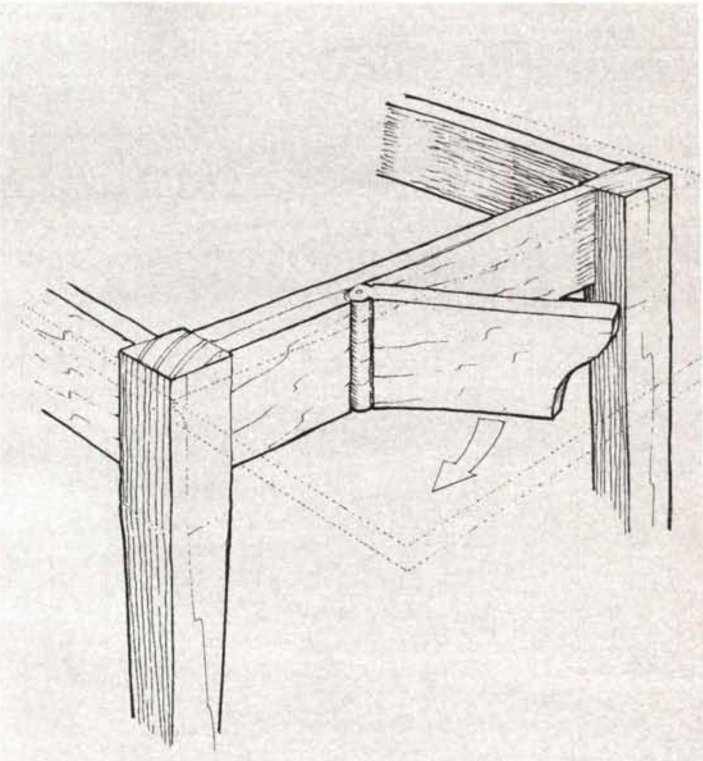
Before you start, bear in mind that hardwood is best since the joint will receive a certain amount of wear. It's also important to design the joint large enough for the drop–leaf you intend to support. Both the thickness of the stock and its width must be sufficient and will influence the design of the table's skirt.

The two parts of the joint, which in the case of a drop–leaf supporting bracket consist of the part that is fixed to the table's skirt and the part that actually swings out to support the drop–leaf, must be prepared perfectly square and true and to the same thickness. Set a marking gauge to exactly half the thickness of the workpiece. Holding the gauge's fence against the face of the workpiece, lightly scribe a short line in the center of the top or bottom edge. Now hold the gauge's fence against the opposite face of the workpiece and scribe a second short line on the same edge as before. If you have set the gauge accurately, the two lines will be perfectly superimposed. If they are not, adjust the gauge's fence accordingly. When you are sure the gauge is set accurately, scribe short lines in both the top and bottom edges of both workpieces. Now scribe short lines in these same edges while holding the gauge's fence against the end of the workpieces. The crosses thus produced mark the exact center around which the two parts of the joint will pivot.

With an accurate miter square, scribe lines on the top and bottom edges that run diagonally across the edges from the extreme corners, as shown. If you have worked carefully thus far, these diagonal lines will also intersect at the center previously marked with the marking gauge.

The next part is the hardest and requires that you use a pair of dividers whose legs are finished in sharp points. Place one leg on the marked center and adjust the other leg so that it just touches the edge at the center of the end and at the *sides of* the workpieces.

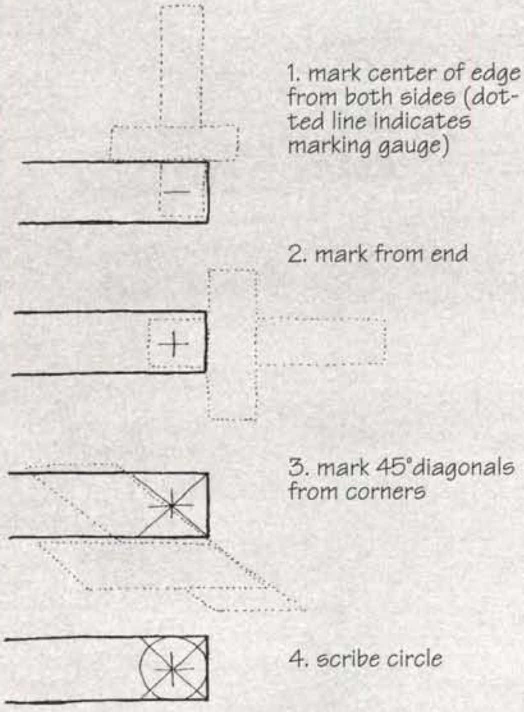
Before starting to form the rounded section just marked out, consider the fact that stopping the rounded section at the diagonal lines will permit the pivoting piece to move through an angle of exactly 180°. This is normally enough to allow the drop–leaf to hang perfectly vertically, at right–angles, to the top. If, for some reason, you want the leaf to hang at a different angle, you can adjust the amount of movement by cutting the stop forming the shoulder on the rounded part of the joint either before or after the diagonal line as desired; the only caution being that you do not want to weaken the knuckles by excessive undercutting.



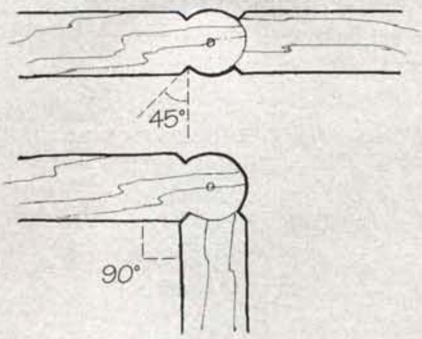
knuckle jointed bracket

To make rounding the knuckles easier, square a line from the point of intersection of the diagonal lines and circle on both edges, then connect these lines across both faces. Now make careful sawcuts in both faces on these lines, as shown above, that stop exactly at the scribed circle. As a further guide, draw pencil lines down the end and down both faces, connecting those places on the edges where the scribed circle touches the edge. These pencil lines should not be removed by any shaping and will help guarantee the roundness of the part. A chisel is useful for removing most of the waste, especially at the neck. A small block plane may be used for smoothing the outside rounded areas. A rabbet or shoulder plane is useful for forming the inside shoulder of the neck. Final shaping can be done with a rubber (as shown in the last column), just be careful not to remove any wood inside the circle and shoulder lines.

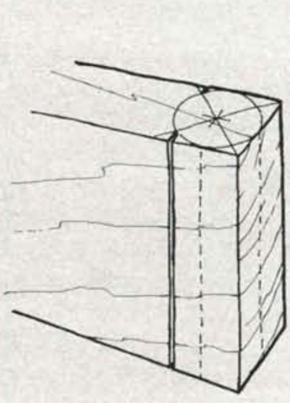
Mark out the knuckles on both rounded ends bearing the following points in mind: There should always be an uneven number of knuckles so that one piece, usually the fixed piece, has a knuckle at both ends. Five is normally the minimum number that will guarantee a joint with sufficient integrity, but there is no real upward limit to the number of knuckles possible. Keeping the knuckles approximately as wide as


1. mark center of edge from both sides (dotted line indicates marking gauge)
2. mark from end
3. mark 45°diagonals from corners
4. scribe circle

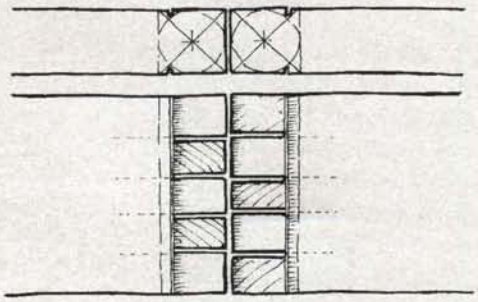
marking layout for knuckle joint; repeat procedure on both ends of both parts



by altering the 45° cut, the angle at which leaf hangs can be altered



saw cuts and pencil lines (dotted lines) to guide forming round section



edges before rounding

faces after rounding

shaded portions to be removed, note relation of kerfs to dotted (pencil) line

they are thick is a good idea; but the more knuckles there are, the more work there will be to cut them.

After you divide the rounded sections on both workpieces into perfectly matching knuckles, mark the waste parts clearly and hold the two parts together to check that you have done this correctly. When you saw down the lines be certain to saw on the waste side of any given line only. Doing this carefully will produce an exact joint. Sloppy sawing, sawing on the line, or sawing on the wrong side of the line will produce knuckles that will not fit; they will be either too loose or too tight.

The part whose ends are sawn away should have these ends sawn square first, cutting down the inside of the line that connects the bottoms of the shoulders. The remaining curved section can be cut with a gouge (preferably an in–cannel gouge—one whose bevel is on the inside of the curve) of an appropriate sweep or arc. To remove the inner knuckles work in with a chisel from both sides, just as when chopping dovetails, cutting first straight across, and then excavating the inside curve by using the chisel with the bevel down. A back–bent carving chisel might be useful here; but, although a little awkward, a regular chisel will work fine providing you take care not to cut below the line on either face.

Make sure the knuckles fit together perfectly and that the inside shoulder lines line up. Clamp two pieces of scrap across the faces of the joint to keep the two parts perfectly aligned, and bore in from both ends to produce the centered hole for the pivot pin. A drill press if set up properly will guarantee a perfect hole, but it should not be too hard to bore the hole by hand using a hand drill, a brace and bit, or an electric drill. The size of the hole should match the pivot pin. Some people prefer a metal pin for strength, others prefer a wooden pin because of the likelihood of the metal rusting and discoloring the joint. Although rarely necessary, a wooden pin offers the additional advantage that it can be fixed in place (by gluing or pinning through one knuckle), whereas a loose metal pin that works loose will have to be peined over at one or both ends.

After applying the finish, the joint can be lubricated with candle wax for easy rotation.

Mastering the rule joint and knuckle joint will not only enable you to add drop–leaf tables to your list of projects, but may also suggest further sophistications for other applications. A rule joint can be used for cabinet doors, knuckle joints can be adjusted to provide brackets that open exactly and have varying capacities, and the two in combination will make possible varieties of 'movable' furniture never considered before. Best of all, both joints can be produced with a minimum of tools.

Tried and True

Hinge-Mortising

In last issue's column I described the process of joining the two parts of a rule joint with table hinges by simply mentioning the need to lay out the hinge mortises and excavate them fully. In the meantime Robert Wiecezak of New Hyde Park, New York wrote in to describe the difficulty he experienced in trying to perform a similar operation with butler table hinges. He mentions the sloppy results achieved using a router without a template, as well as his unsuccessful attempt to excavate the mortise with a speed bit and chisel. His final method, which he says "...left results that had a lot to be desired," was to use a forstner bit and a chisel.

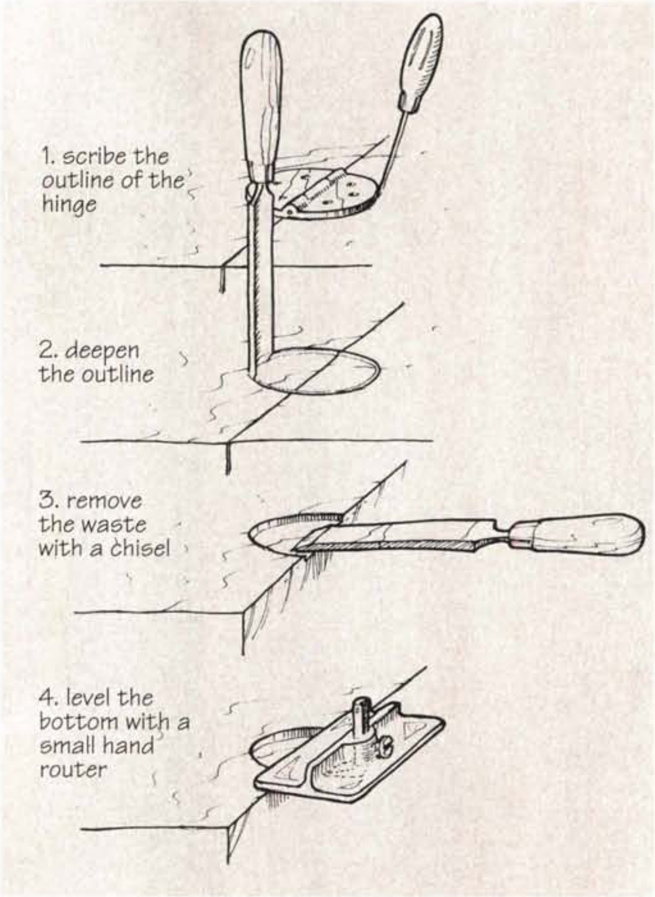
Whether the hinge to be mortised is round, like butler table hinges, or the more common, straight-sided variety, such as table hinges, the problem is the same: How to achieve a close-fitting and evenly excavated mortise for the hinge.

My method, which uses only handtools, is as follows: Start by scribing the outline of the hinge on the surface where it is to be mortised. This, of course, assumes that you have already ascertained its position by careful measurement and accurate layout lines. Use a sharp marking awl, or simply a nail with a sharp point, and keep the point as close as possible to the hinge as you scribe around it.

Now deepen this line using a chisel—or a gouge with a sweep as closely matching the curve as possible—and a mallet. An in-cannel gouge (with the bevel on the inside of its curve) is best, although the more common out-cannel gouge can also be used if held carefully at an angle. Note that a gouge with a tighter sweep than the curve of the required mortise can be used if necessary, but a gouge with a shallower sweep is as useless as a straight chisel in this situation.

For most hinges you will not need a very deep mortise and the deepening line will not have to be made with much force. If the hinge mortise is deep, however, you will have to take care that the scribed line is deepened with a straight side, and not turned into a V-groove, as will happen if you simply drive a chisel straight down into the surface of the wood. To avoid such a V-groove, first mark the scribed line with a chisel lightly, and then use the tip of the chisel or a marking knife to remove some wood from the waste side of the line. Now proceed to deepen the line with the chisel and mallet, making sure to hold the chisel perfectly vertical, keeping the bevel towards the waste side.

When the outline has been established, start to remove the interior waste by chiseling towards the scribed line. If the grain is strong, work with it or across it, but not into it or it may pull the chisel deeper than you want to go. If one side of the mortise is open (at the edge of the workpiece) scribe a depth line on this side and use the chisel bevel-up working in from this line.


1. scribe the outline of the hinge
2. deepen the outline
3. remove the waste with a chisel
4. level the bottom with a small hand router

With practice this will be all that is necessary, but there are additional steps that can be taken to ensure a perfectly level bottom to the mortise. The first is to use a small hand router, like the Stanley router plane, #271, or its Record equivalent. Its cutting edge can be adjusted to the precise depth needed, and its sole will bear on the work-surface around the mortise, producing an even-bottomed mortise. You can progressively deepen the mortise by resetting the cutting edge deeper or rough out the approximate depth with a chisel and use the router just for the finishing touch.

Another device that can be found in mail-order catalogs is a small plane-like body that will accept a chisel. When driven along, this will also produce a flat-bottomed mortise.

Yet a third method useful where larger, but not necessarily deeper, mortises are required involves using a Dremel Moto-tool® in its proprietary router attachment. This is usually far easier and more appropriately sized than using a regular router. Certain hinge applications involve setting the hinge on a slope, the knuckle often being placed deeper than the opposite leaf end; a router is no good for excavating this kind of mortise unless you attach a wedged shoe to the router base. Just as when using a chisel, work from the center towards the deepened outline. With care you will not violate this outline and the hinge will fit neatly into its mortise.

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Shop Safety

It's In The Mind, Not The Tool

Safety is not in the hands of the Gods. It's a mind set; a learned skill along with that of tool handling. Barring tool malfunction, there's no logical reason why any woodworker should be injured. The possibility of an accident must be anticipated and remedied before any tool is turned on. Shop accidents are not inevitable and with proper precautions and foresight they can be avoided.

Foresight is the act of previewing an operation with safety in mind. Taking a chance is knowing a rule and deliberately breaking it; for example, side grinding on a wheel that isn't designed for it, or shaping an edge on a workpiece that is too small for safe hand position.

Previewing for safety should include taking the time to do a dry run. When confronted with a foreign or new operation, one you originate or one you copy, prepare the setup, and with the tool turned off, rehearse the procedure so you can plan where your hands and body will be before, during and after the cut. Remember, pieces of metal and plastic can't think for you.

***R.J. (Cris) De Cristoforo**, is a woodworking and tool authority and is a Contributing Editor to* Popular Woodworking.

Knowing The Tool

In depth knowledge of a tool—how it functions, its primary purpose, and its limitations—is essential education. Too often the owners' manual accompanying a new tool is thrown out with the box it came in. In our haste to to put our new tool to use, rules and reminders about safety are ignored. In a sense, we try to graduate without taking tests.

Make sample cuts so you can establish a feel for the machine. With portable tools, like a router or circular saw, grip it as you should and turn it on and off a few times. Listen to it, feel the initial surge, understand that it takes a little time for the cutter to stop before you can safely set the tool down.

For larger, stationary tools, like a table saw, check for precise alignment of the components—they're essential for safety as well as accuracy. Don't assume they were properly set before packaging. They probably were, but be dubious. If you assume anything, assume the worst, like the tool was altered during shipment and must be retuned.

I watch woodworking shows on TV and am occasionally dismayed by unsuitable attire such as a waist–long necktie and floppy sleeves. Body adornments such as rings, wrist watches and bracelets are hazardous. They can snag on idle or running tools. But hearing a scroll saw demonstrator state, "this is a safe tool," got me thinking that our attention might be subconsciously influenced by the extent of conceivable harm from a particular machine. It shouldn't matter whether a blade or other cutter can just lacerate a finger or remove it. Safety is not a matter of degree. The same respect should be given to a ratchet as a router.

A respected woodworking friend of mine once advised, "Don't ever trust any tool!" There is no such thing as a safe tool and that should be our perennial attitude. Further, be aware that injuries are not always visible. Tool noise can adversely affect hearing and small dust particles can scar lungs.

A wound that can be covered by a small adhesive bandage is no more acceptable than one requiring more critical attention. Any wound, no matter how slight, indicates lack of attention and disregard for safety considerations.

To Guard Or Not To Guard

There are pros and cons with respect to blade guards. Aspects of some guards can lead to a false sense of security. The table saw guard probably causes the most controversy on whether or not to use a guard. This is not surprising since it is one of the most widely used tools.

The common guards on table saws consist of three components; a see–through blade cover that should settle nicely on the surface of the work as the pass is made, a splitter that is designed to keep the kerf open so binding and kickback won't occur and serrated anti–kickback fingers, or pawls, that allow work to pass, but not reverse direction.

It's common knowledge that many woodworkers, amateur and professional, consider the guard a nuisance. Since we don't have OSHA (the Occupational Safety and Health Administration) looking over our shoulder, it's a personal choice that must be responsibly exersized.

There are some operations that can't be performed on the table saw with guards in place. For example, you can't leave a splitter in place when dadoing, grooving or making molding cuts. Often the whole guard must be removed or, when possible, swung down out of the way behind the saw. During these operations special care must be taken. When doing these operations I imagine a force around the blade which I can never encroach.

There are safety accessories available for some machines which are often more convenient to use, and do a better job, than those supplied by the manufacturer. That's not to say they're perfect. Safety is a personal responsibility which sometimes requires the purchase of specialty accessories available commercially or custom built in your shop.

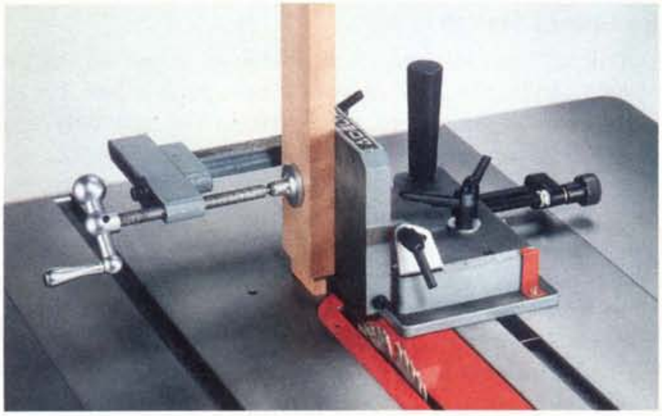
Need a Hand?

Take the time to make devises that can substitute for fingers when working in a tight areas. Push sticks and featherboards are essential when making narrow rip cuts on a table saw; they and are also suitable for use on machines like jointers or band saws. Take time to make several of these. The plans for just a couple versions are given. They can be adapted to meet special needs—I like to keep several on hand. I hang them in easy to reach spots around the machine for which they were designed.

Springsticks, or featherboards, are horizontal or vertical hold–downs that increase safety and accuracy on many woodworking chores. They can be clamped to the table to keep the work against the fence during a pass. When used like this, clamp the feather board ahead of the cutter blade. Featherboards can also be clamped to the fence to hold work down on the table. Using both in conjunction, on a table saw for example, minimizes the need to control with vulnerable fingers.

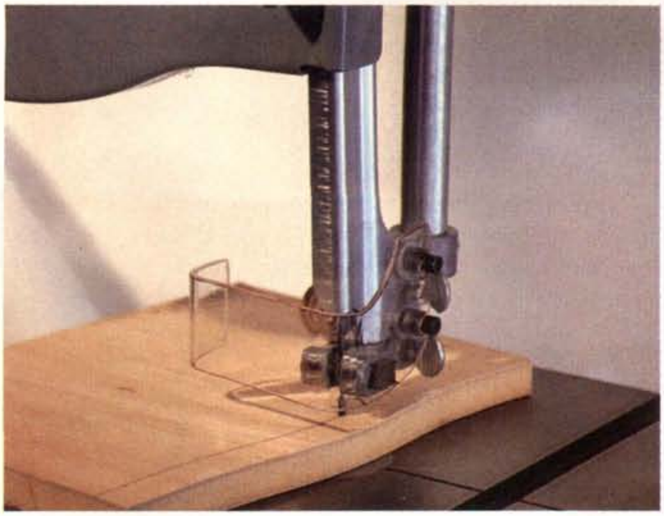
Creating Protection

Since, for me, a safe tool doesn't exist, I often add to an existing guard or invent one for the machine, like a drill press, that lacks one. I've made and use the drill press shield, adjustable shaperguard and bandsaw fingershield, shown in the photos. I custom build these to fit my particular machines, however the time spent making them provides immeasurable safety dividends.

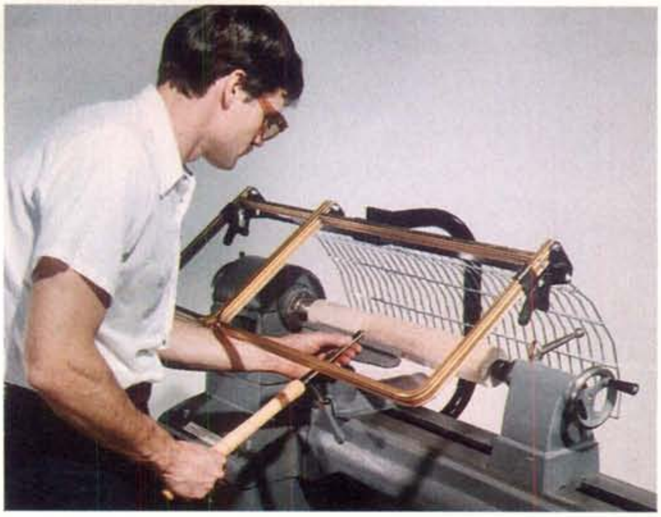


If making tenons, a jig like this is essential. Not only does it make the procedure safer, it greatly increases accuracy.

Automatic blade return and a brake combine with a clear retractable shield to optimize safety on the radial arm saw.



The finger shield for a band saw, made from a piece of 3⁄16" or 1⁄4" polycarbonate, is used together with the regular blade guard.



Two clear adjustable panels provide full coverage without interfering with the operators access to the work on this lathe.

Beyond Hands

Safety goggles, hearing protectors and dust masks are as critical for your well being as tool guards. All most woodworkers need is a little coaxing to wear eye protection, but it isn't always as easy to convince some that ears and lungs are just as vulnerable.

Headphone–style hearing protectors should always be worn whenever using indoor or outdoor power tools. Disturbing frequencies can be generated by high–speed electric motors and by the air waves caused by saw blades and other cutting tools. It's important to understand that the effects are cumulative; each exposure contributes to potential hearing damage. Quality ear protectors will screen out damaging frequencies, but still allow normal conversation and the woodworking noises you should hear.

Don't assume that a dust mask is needed only when doing sanding chores. Sawing, routing and shaping, lathe turning and other common woodworking operations produce fine waste particles that can damage sensitive lung tissue. Also, some exotic tropical woods are toxic and can cause severe allergic reactions. It's good practice to change the filters in respirators frequently so the unit functions efficiently.

Disposable dust masks are inexpensive and comfortable to wear, even with safety goggles; but they don't protect against toxic fumes like the more sophisticated respirators.

A Clean Ship is a Happy Ship

Allowing your work area to become dirty and cluttered is both dangerous and inefficient. Leaving scraps underfoot can cause you to trip. Dirty, gummed–up saw blades can lead to wood burning. Sometimes you won't get a clean cut, leading to binding and kick–back. Maintain tool tables, blades and cutters by occasionally cleaning them with special solvents available at most hardware stores.

Keep table surfaces clean and smooth. Clean the surfaces of tools like the planer bed and table saw top. Coat them with a paste wax then rub them down to protect them and keep them smooth.

Provide adequate support for oversize work, like a plywood panel, by using an outboard support stand or by asking for assistance. Explain to the helper beforehand what the procedure will be so they will know how to cooperate.

If you're tired, upset or have taken medication that can affect alertness hold off on shop work; substitute a less demanding activity.

Socializing in the shop with fellow woodworkers can be pleasant, but working and visiting make for a dangerous combination. Alert your friends and neighbors that they must not barge into your shop, especially if they hear a tool running. You don't want to be startled while engaged in any woodworking operation.

Be strict about never working with a piece of wood that is too small for safe handling. For example, don't precut wood to size and then shape it when you need a narrow molding. Instead, do the shaping on a piece large enough for handling and then saw off the part you need.

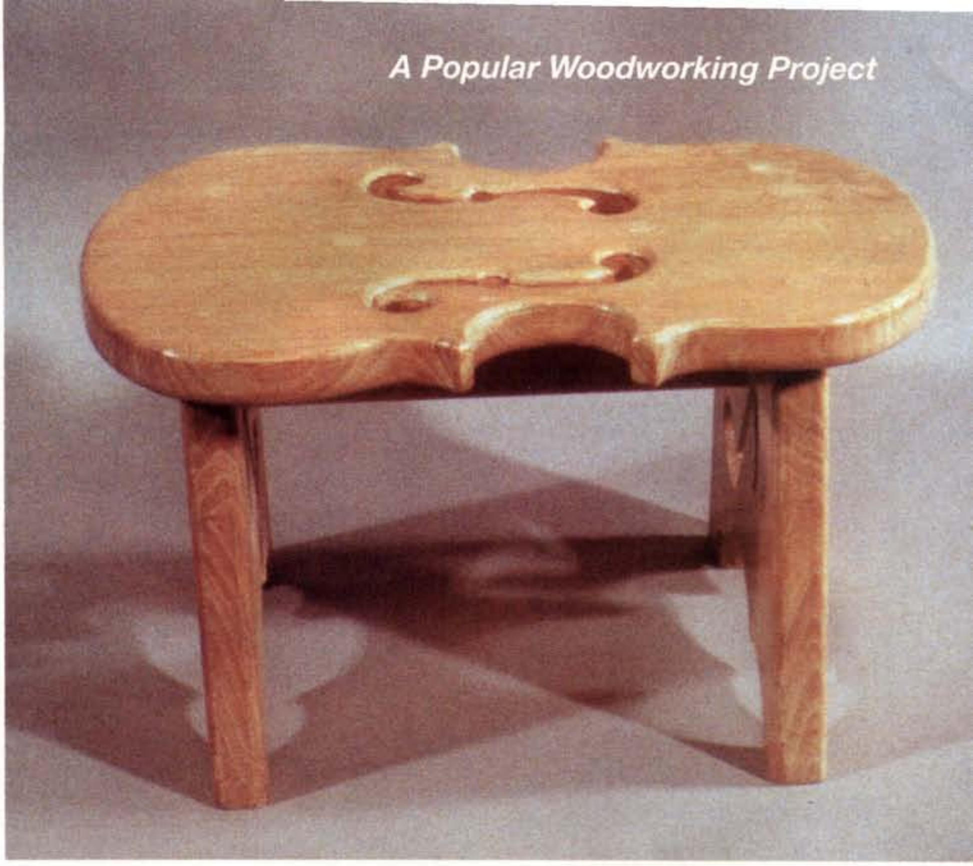
Be Sharp, Stay Sharp

Dull tools are forbidden. Cut or shaped edges will not be of optimum quality and, since dull tools require the user to apply extra feed pressure, they increase the possibility that your hands might slip.

Be warned if you must use force to make a cut, it indicates a dull tool or that you may be cutting too deep in a single pass. It's wiser to make several shallow passes rather than one deep pass.

In any environment, making safety a fact of life involves taking personal responsibility. It requires learning about an activity and then approaching it respectfully. Use common sense. Visualize a possible hazard before attempting the operation and be prepared to react to an unexpected situation. PW

Fiddle Stool					
Cutting List					
		Finished Size			
Qty	**Part**	**T**	**W**	**L**	**Piece**
1	A	1"	10½"	16"	top
1	B	1"	8½"	10"	ends
1	C	1"	2¼"	9"	brace


A Popular Woodworking Project

Fiddle Stool

by Devore O. Burch

An old time woodworking friend of mine, Echols Frazier, loaned me his patterns for this unusual stool over thirty years ago. He made these stools to sell at craft shows. I make them to give away as gifts and have made quite a few over the years.

The original stool was made from ¾" stock, but the appearance is greatly enhanced when it's made from ⅞" or 1" stock. I use remnant pieces, edge glued butcher block fashion and planed to the desired thickness. A three foot length of 1 X 12 blank will do nicely.

I've made these stools from a variety of different woods, including pine, maple, birch, oak, walnut and poplar. If you plan to make more than one, I recommend making a set of patterns out of ⅛" hardboard or ¼" plywood. You might also photocopy the full–size patterns in the PullOut™ Plans and store the originals in a safe place.

After preparing the stock, transfer the top (A) and end (B) patterns from the PullOut™ Plans. With a Forstner bit in the drill press, pre–drill the holes in the top and ends as located in the patterns.

Cut out both patterns on the band saw. Sand all the edges to remove any saw marks. Also, do the scroll work in the top and ends, then sand their edges.

Bore the pilot holes for the eight #8 X 1¼" FH wood screws. Counter bore these holes ½" X ⅜" deep for plugs to cover the screw heads. With a ½" plug cutter, cut the plugs from some of the scrap wood trimmed to make the top and ends. This makes for the best match of color and wood grain.

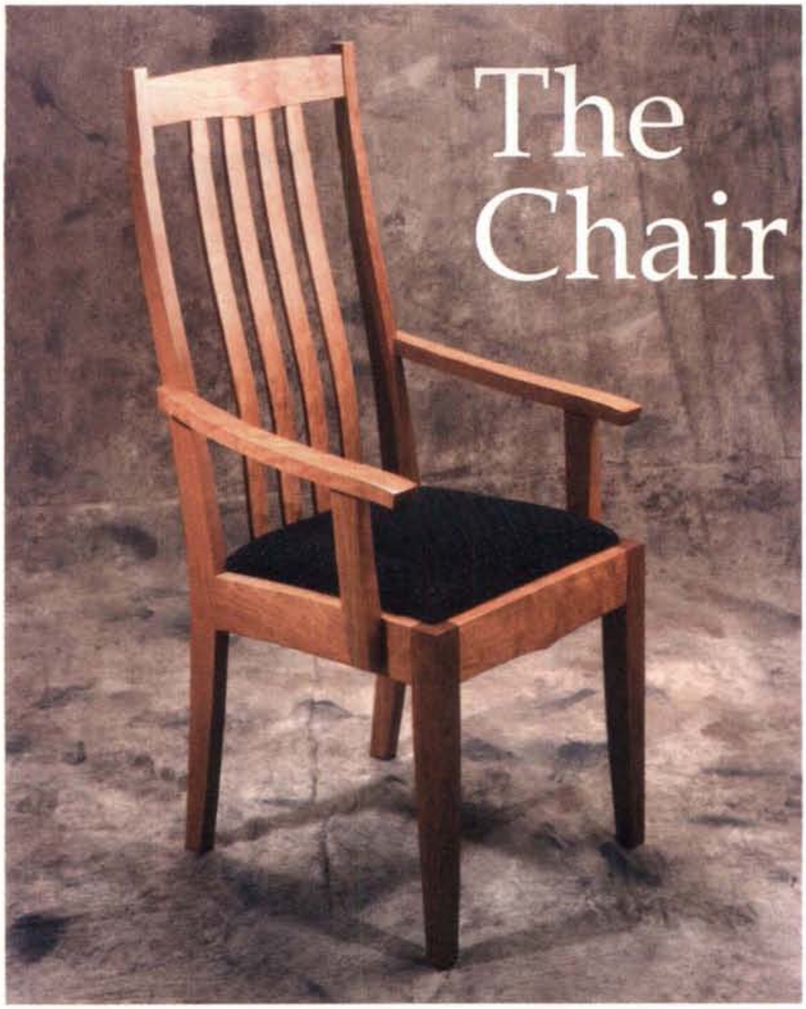
Now, round over the edges. I use a ¼" radius round over bit on the perimeter of all parts and a ⅛" radius to rout the inside edges of the scroll–sawn patterns. Finish sand all the parts.

Assemble the complete stool as follows: attach the brace (C) to the top, then attach the ends to the brace through the pre–drilled holes in the ends. Tighten all the screws, then put a little glue in the plug holes and insert the plugs. Note the grain direction of the plugs and try to match their direction with that in the surrounding wood.

When the glue has dried, scrape or chisel the excess flush with the surface and do any final sanding necessary. The finished stool can be stained or finished to best fit the environment in which it will be placed. PW

Bandsaw the outside pattern then use a scroll saw to cut the inside notes.

***Devore Burch** works wood in Fort Worth, Texas*



The Chairmaker

Chairs are tough to build and few furniture makers like to build them. That's what Dennis Loveland found when he talked to fellow members of the Oregon Woodworkers Guild. Yet, Dennis likes to design and build chairs and putting these two facts together gave him an idea; he made the decision that this would be a better direction for the small business he had started. Rather than the cabinets he was then making, he decided to design and build chairs, then sell them to other furniture makers in the northwest for them to market with their tables and other furniture.

Dennis got his first taste of woodworking in high school, and liked it. At Mt. Hood Community College he took a two year course off and on again in art and design, then left at the end without a degree. He'd worked while attending college and decided to give up school and work full time. With his high school woodworking experience he got a job in a cabinet shop. On the side he made and sold jewelry. After a few years he decided that, "Jewelry wasn't as practical or as fulfilling as I wanted it to be so I concentrated on working with wood, and finding that I enjoyed it, I stayed with it." The cabinet company where he worked made hotel and restaurant furniture—all the furnishings from interior woodwork to restaurant seating areas. He did a little of everything over the years, but spent most of his time running the framing department, which was essentially the seating department, and dealt with the furniture end of it. After eleven years at this job he decided it was time to start working for himself. I asked him…

***If you have any questions** on the subject discussed in this article you may direct them to Ken Sadler, 75 NW 90th Ave., Portland, OR 97229. If you are a Compuserve user, the address is:* Ken Sadler 76334,735. *Mr. Sadler would also be happy to offer suggestions on any other business related problems.*

by Ken Sadler

Why did you want to do this?

I got tired of working for other people. I really wasn't happy and I didn't feel I could be creative. Art was my major in college, I always enjoyed creating my own woodwork, and I felt that there was really no opportunity for me to do that while working for others. I decided the only way was to do it on my own. I'd been aiming at it for several years before I actually did it. I bought my tools, and knew I was going to quit at a certain time.

What caused you to concentrate on chairs?

Although I started out doing whatever work I could find—mostly cabinetry—I liked making chairs. I think chairs are very difficult to do as compared to a case goods piece which is generally four square corners. A chair is sculptural and it says a lot about your ability as a woodworker. I wanted to show people that I was a good woodworker and that I could do anything. I figured if I could make a good chair, people would think I could do anything.

You said you were building chairs for other furniture makers, was that your first market for chairs?

Yes, I started doing a few chairs for some shows, like the Table, Lamp and Chair show. I did a few chairs experimentally on my own and showed them around. People said they could use them; so I started producing chairs they could sell along with their own work.

Did you build these chairs to your customer's designs?

No they were my own designs right from the beginning. My customers saw how my work could fit in. Sometimes I would design my chairs to have a better feel with their furniture.

You adjusted your designs for each client?

Yes, that was the way I worked.

What was your design philosophy?

At first, I thought I would design only contemporary pieces; but I found it's very difficult to expand your market doing only contemporary work, especially if you want to sell it to other furniture makers. So I began blending some craftsman styles in with my contemporary design. I hoped to give something pleasing to a wide range of people—including other furniture makers who might want to use my work. My philosophy developed as my style evolved.

Do you have any definite style at this time?

I believe that I do, and I think my Columbia dining chair is probably a good indication of where I'm going with my work. It has a unique style that characterizes my design goals.

Are all of your chairs based on that style or are there others that are what you might call routine and that could be built by almost anyone?

I have one or two styles that I think could be built by almost anyone. They're not all that different from the others out there and you may not recognize them immediately as mine. But my other styles, I think you'd recognize them over someone else's if you saw them.

What kind of woods do you use in your chairs, where do you get it and do you have to spend quite a bit of time searching for it?

I use a lot of Oregon walnut and I usually have several suppliers for it. Much of it I get it from Lewis Judy down in Jefferson, but it's spot buying; so yes, I do spend time searching for it. I buy the cherry from various sources. Because you're never really sure what cherry is going to look like, you have to go out and see it. Decent cherry is so hard to get out here in the West, especially in five and six quarter stock, and it's difficult to find good quality stuff that's not just all sapwood. I also use mahogany and I have to shop around for it because you can get stuck with some pretty bad stuff if you're not careful. The price fluctuates so wildly that it's also tough to find it at a good price. I also use maple and try to use as much figured maple as I can get my hands on.

Are you using Oregon maple?

I've used quite a bit of it, as a matter of fact, I have had several orders where I will use the Oregon quilted maple, which is real figured stuff, for back slats and decoration pieces in dining room sets.

What percent of the cost of your products is the wood?

That varies with the piece. If it's Oregon walnut the percentage goes way up, but generally it's about 20% of the cost of the piece.

Do you change your prices accordingly?

Sometimes, however, it's difficult to have a different price for every little thing. For example, if I use an exotic wood for the back slats, I don't want to raise the price just because I'm adding a little detail. I try to keep everything within a set range so it doesn't throw the customer off.

How much equipment did you have when you started your business?

I started collecting equipment well before I went into business. I knew I was eventually going to do it, so I had a good table saw, band saw, jointer, planer, and a lot of power hand tools and of course a lot of hand tools. I was pretty well stocked before I ever got in business.

How much did you have to invest in that equipment?

It was so spread out that I couldn't really give you an accurate figure, but it was probably four or five thousand dollars.

How much do you have invested now?

I would say fifteen to twenty thousand dollars over all.

How long did it take you to start making a living from your work?

It took a long time. The first couple of years were pretty lean, especially doing cabinets and trying to work other things in. I'd say it was three and a half to four years before I considered I was making a decent amount of take home money—more like four years.

How did you finance it?

I had saved quite a bit of money, and of course had all my tools, so I didn't have to borrow any money. I haven't borrowed a dime up to this point, although that's about to change. I'm buying some expensive new equipment. My wife also has a good job. Our housing didn't cost very much and the shop was in the basement, so we kind of muddled by. I've been in business for six years and it's only in the last two years that I've considered myself making a pretty good living.

Did you work alone?

For almost four years I worked alone. In the last two years I've added employees. That's helped me get my production levels up and do things that were hard to do alone.

How many employees do you have?

Right now I have one, but I'm planning on hiring another to replace someone who just left.

Did you have trouble finding people you felt were good enough to produce your pieces.?

I always hire people who don't have a lot of experience, but have good basic woodworking knowledge. I enjoy the training part and I feel that since I train them myself, I get them to use my methods which are quicker than if they did it in a manner they learned a long time ago. No, I haven't had too much trouble getting good employees, it's keeping people around that's the problem.

Do you ever subcontract some of your work?

Occasionally I subcontract some upholstery work, like the lounge chair cushions—I can't sew leather here. Once in a while I take a part to someone with a wide belt sander to have work done. Other than that, I do one hundred percent of the work here.

Is this the shop where you started?

I started in this basement and expanded—now I use the entire basement and the garage.

Your original customers were other furniture makers, where and how did you get them? Are they all local or from other parts of the country also?

At first my customers where all local. That was because, being part of the woodworking community through my membership in the Guild of Oregon Woodworkers I met a lot of people and I did a lot of local shows to put my work out. That brought me in contact with a lot of other local woodworkers, they saw my work and some of them began to buy it. Eventually the word got around that I was making chairs and could make them for other people as well. I started going further afield and I now have people in Eugene and Seattle, and I'm beginning to get work out of California. I delivered a set of chairs to a man in Pasadena just about two months ago. He had purchased a handmade table down in California but couldn't find chairs. He was up here and saw my chairs at a gallery and decided they'd be just right with his table. He bought eight of them in Oregon walnut and I shipped them down.

How do you handle shipping to customers that are not local?

That's difficult and it's something I'm still learning how to do. I went through a local packaging company and had stuff crated and packaged and sent out. Quite often, the company I sell the chairs to will deal with it for me. If it's close enough, I'll make the delivery. If I can't do that, I have to find someone who can ship it and I haven't settled on a really good way.

You sell your own designs to your commercial customers, do you market them separately as well, if so through what channels?

I sell them direct and through other furniture makers, they use them on their showroom floors as a display piece.

Do you sell to them and then they resell, or do you just put the chairs on their floor on consignment?

It depends on who I'm doing business with. In some instances they send a customer to me and it's strictly between me and the customer. In other cases where they have a couple of showroom pieces, they'll take an order and pay me when I deliver. However, at the galleries it's on consignment.

What shows do you enter?

I've done the Table, Lamp, and Chair show for a few years although I'm no longer really involved with that. I don't consider it profitable to be in that type of show. It might be nice for your ego to show some things in front of a jury panel, but it's a lot of effort and I don't have much time for that sort of thing. I continue to do the Guild show each fall because I find that that's a good way to keep in touch with my customers. I find that it's a very profitable show. I also do some of the regional art shows and occasionally a gallery will do a show of my work.

How do the shows operate, who attends and do they place orders at the show?

Lets take the Guild show as a example. I think it's the best run show. It's a show where you not only display your work, but make sales. The Guild markets the show widely through advertising, such as flyers and articles in the paper. This builds a wide base of customers that come to the show and you get people who place orders and others that see your work and contact you later and buy.

What is the cost of participating in a show?

That varies widely. If you were to do a large craft fair like an ACC, American Crafts Council—the big regional show—it would cost quite a bit of money.

Do you do those?

No, but friends of mine have done it and I'm considering getting into that sort of show. The small regional ones like the Guild show costs about $250 to enter. You have to add to that whatever you put into your display. That cost, once you've got the setup, doesn't recur with each show.

When did you start selling through galleries?

Almost four years ago, I was doing small turnings as part of my cabinet work and I started putting those in the gallery here in Portland. That got my foot in the door and now I sell my chairs there and through galleries in Seattle and Salem. I'm hoping to get into California—I've been searching for good locations in the northern part of the state.

What percentage do the galleries take?

It's anywhere from 25% to 45%

Do you sell through stores?

No, I haven't tried that.

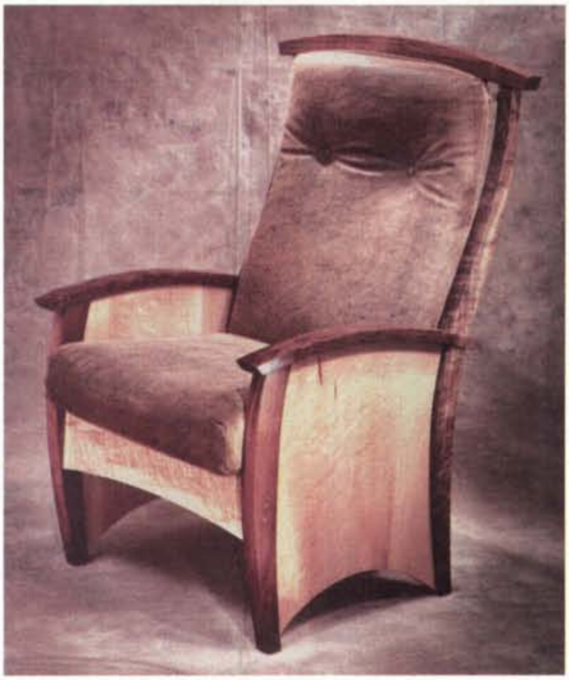
Do you sell anything though distributors or reps?

No not really.

What is your percentage split between the chairs you make for others and those you make to sell direct?

This year it's changed greatly. In the past, the majority were sold through other people, this year 60% to 75% have been direct sales.

How did you set prices in the beginning and how do you do it now?



I set prices on a time and material basis and I try to stay low enough to compete with other woodworkers selling chairs and other furniture. So in order to set a price, I try to estimate how long it will take to build an item once I'm up and running instead of how long it takes to build the first one. It takes time to get the setup refined so you're running efficiently.

How has your efficiency improved over the years?

It's been a pretty slow build up. Not only was I learning how to do it more efficiently, I was learning how to make them better and make more money on them. At first, I wasn't making very much, it takes a long time to make a chair. I was selling them at a slow but steady pace right from the start and chair sales have been doubling each year.

What are your present gross annual sales?

I'm predicting that this year I'll do about $100,000 in chairs. It's been an excellent year so far and sales could turn out to be much better than that.

Do you expect to continue to grow, if so do you have a tentative stopping point?

Yes I do. I intend to grow at least two fold in the next year or two. But I think this year I'm going to do at least what I said and probably more. I also think that once I get a showroom going it could turn out that I've been very conservative on my numbers this year. But it's not a sales figure that I'm concerned about, it's a quantity figure—how many pieces do I want to produce in a year; so I can keep up the quality and continue to be a part of building them as opposed to letting other workers do all the building.

How many pieces do you think that's going to turn out to be?

I think with two to three workers, I can turn out around fifty chairs a month. I think that would more likely be a place to project a stopping point. I hope to work on my efficiency and quality and stay at that level.

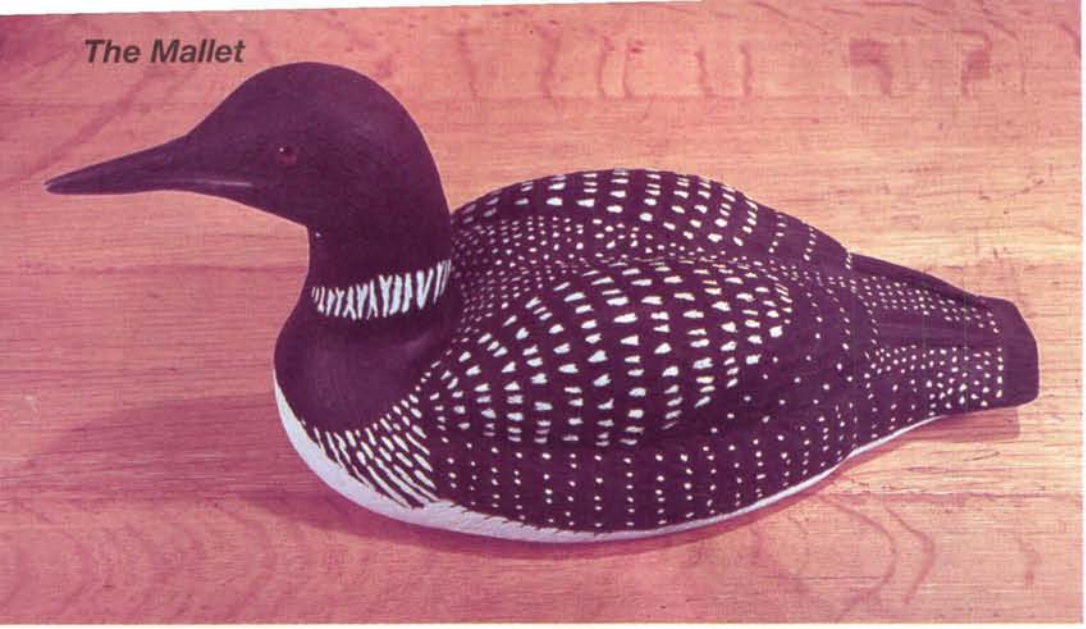
Are there any thoughts you would like to pass on about running a small business, things that you have found important, problems you've encountered that perhaps you didn't expect, new ways of doing things that you have learned?

Yes, there are quite a few things that I've found about running a small business that were not what I expected. One is the amount of time you have to put in outside of building your furniture. Probably one of the main things that people don't realize is that running a small business is as much being the secretary, the gofer, the designer, the sales person, and all the other things that come along, as it is making the product. You have to keep improving your business, the only way to do that is to keep up with the technology and to improve what you do all the time. You can't be content with the way you've been doing things, you have to improve your speed and techniques, by taking classes, inventing a new jig or doing something to make yourself more efficient.

Do you find running a small business as gratifying as you thought it would be?

I really enjoy running my own business, I like being my own boss and I enjoy the creative process. I like dealing with customers directly.

In Dennis Loveland's story you can see the how basics of a woodworking hobby, a basement workshop and some basic power and hand tools, can be turned into a business. It can be a full time business like his, or a part time one that you use to expand your horizons a bit and gain some extra income. Whichever path you take, his experiences can serve as a pattern for your success. PW



Carving the Loon

by Lloyd Smith and Michel Theriault

While canoeing in mid–northern Ontario, it's possible to come across this large elusive bird. It can swim underwater for long distances and when it flies, the whisper of its wings creates an eerie sound. At night, hearing their call will send chills up and down your spine; if you hear it any other time of day it's a warm invite to the wilderness.

Making your own version of this magnificent bird is both an enjoyable and rewarding challenge. The pattern provides a bit more wood than an advanced carver might need, so if you make a mistake it can be corrected without causing much of a problem. There are three typical woods used for this type of carving: clear pine, tupelo and basswood. Basswood is used here because it's the easiest to find at the best price.

A lot of preparation is required before and during the carving process to ensure an accurate loon. Draw several reference lines on the blank as carving progresses to maintain the correct profile and contours. Carefully study the photographs and illustrations before you begin. This investment of time will ultimately make the marking and carving steps easier.

The Head

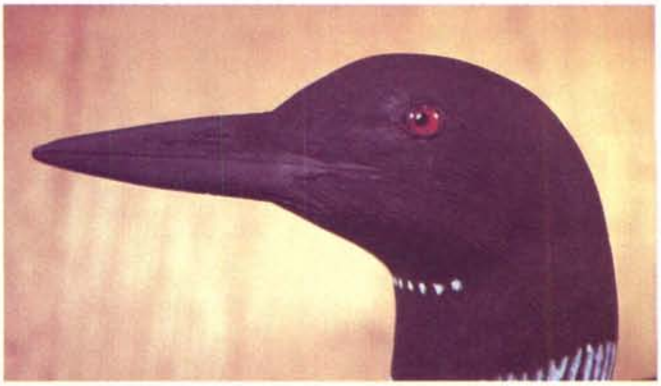
Start with the head. The shape of the head and beak are important characteristics of the loon, so take care to reproduce them as accurately as possible. Cut the head out of a 5" X 2¼" X 7" blank. When cutting out the pattern of the head, make sure the grain of the wood runs horizontal to the beak. This gives the beak strength; in any case, when you're carving or sanding the beak, use light pressure to prevent breaking it.

To preserve the patterns given in the PullOut™ Plans you may wish to photocopy them first, then glue the copy onto the blank using a temporary spray adhesive. Cut out the profile just to the outside of the line using a bandsaw with a ¼" blade. To maintain the proper location of the eye throughout the carving process, drill a ⅛" hole through the blank at the eye as shown.

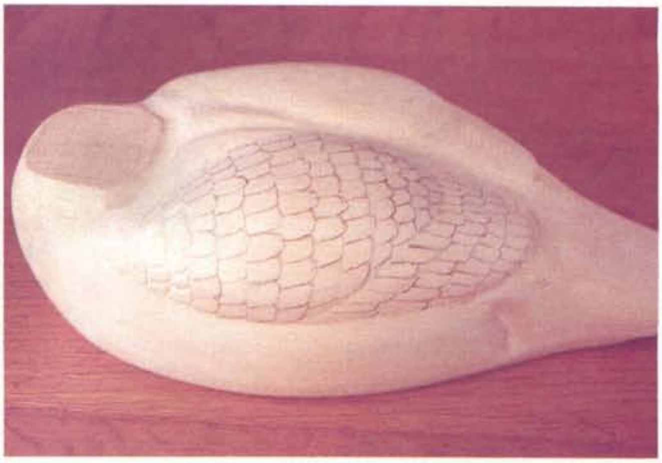
Begin the reference markings by first drawing a center line on the top of the head and continue it all the way around using a pencil and flexible plastic ruler as shown in the figure on page 35. Using this line as a reference, measure ⅞" to the left and right and draw parallel lines all the way around the head at those points as well.

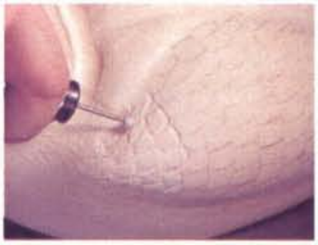
Measure ⅜" directly behind the eye and make a mark there. Draw a line from where the head joins the neck at the bottom (approximately where the cheek would start) up through the mark you just made behind the eye to the top of the head. Repeat this on the other side, then draw a line joining these two lines across the top of the head (see figure). Once you have done this, draw in the reference lines for the cheek as shown on the pattern.

The tip of the beak measures 3¾" from the eye, so measure this distance and mark that point at the tip on the center line that you previously drew on top of the head. Using a



Lloyd Smith and Michel Theriault *live in Ottawa, Canada and collaborated on this project. Lloyd is Michel's father–in–law.*





square, draw a line through this point at right angles to the center line. Next, measure 1⅞" from the eye and do the same. At this mark, measure out ¼" on each side from the center line and join these points with the point of the beak and with the line you previously made at the top of the head. These will be your main reference lines for the top profile of the beak and front of the head.

Leaving the side profile of the beak for now, use a ¾" ball–nose cutter on your power carver to take out the waste on both sides of the beak until you bring the beak and front of the head down to the lines. Refer to the beak figure to maintain the correct contours. At the same time, round and shape the neck and head—refer to the photos to get a better idea of the shape. The head and neck are slightly squarish and are not completely round in cross–section. Carve the cheek line using a ½" or ¼" ball–nose cutter.

From time to time you should take a break from the carving. Set the head down and take a look at what you've done; put your hands around it to make sure it feels right and is evenly carved all around.

The beak is an important element which distinguishes the loon. Now that you have roughed out the head and beak top profiles, carefully mark the beak details and carve them in. Establish the center line of the beak by measuring down ¾" from the center of the eye, then draw a straight line from this point to the center of the beak's tip. Repeat this on the other side, then check to see if the beak line is even on both sides. Do this by holding a pencil or straight edge at the line on one side of the head and sight from the other side while you hold it out at arms length. If the lines don't match, redraw them.

Once you're satisfied with the center line of the beak, burn the lines in approximately 1/16" deep. If you don't have a burning tool, you can incise the lines with a knife. This line serves as a reference for the rest of the details on the beak and to maintain the correct shape.

At this point, you should finish shaping the head and beak before continuing with the detailing of the beak. Check to make sure you are satisfied with all the contours and sand the entire surface using 80–grit then 150–grit sandpaper.

To detail the beak itself, carefully draw in the required lines (see beak figure) that show how the beak connects with the head and where the nostrils are located. Burn these lines 11/32" deep, then carefully burn the nostril all the way through the beak. Once this is done, use the burning tool on the lines once again, this time keep the tool tilted towards the beak to lightly round the interface between the beak and the feathered area. This makes it look as if the beak line runs under the feathered surface.

Finally, texture the head by stoning it with 1" strokes using a ¼" cone–shaped stone in your power carver. Start just behind the beak and work your way over the head and down the neck. You will continue this process once you attach the head to the body.

For the eyes, drill out the existing ⅛" hole with a 11/32" drill bit approximately ¼" deep and perpendicular to the surface of the head at the eye. Test the fit of the eyes and drill deeper if necessary. Use some plumbers putty to make a bed to set the eye in, adjusting it until it looks right. Use braid epoxy for the eyelids. Once mixed, roll it out on a table to a 1/16" diameter rope then form an eyelid by pressing the rolled piece against the side of the head with a small knife. Again, refer to the photographs.

The Body

For the body, you will need a 4" X 7½" x 14" blank, with the grain running in the long direction. As with the pattern for the head, photocopy the pattern for the body and save the original. Glue the top profile onto the blank with a temporary, spray adhesive. Use a band saw with a ¼" blade and cut out the profile to the outside of the lines. Save the side scrap pieces and tape both pieces back in place, then align the side profile pattern and glue it to the side. Make sure that the flat on the top front of the blank where the head attaches is straight and true. If you have access to a bandsaw with an 8" cutting capacity or more, you can now cut out the side profile. If you don't have a bandsaw with the needed capacity, first carefully cut the flat with a handsaw, then cut off the rest of the waste in pieces.

To help hold the blank firmly while you carve, screw a small piece of scrap wood to the underside so you can clamp it in your bench vice. Draw guidelines onto the blank for use as a reference while carving.

First, draw a center line from the front of the blank to the end of the back, just before the tail. Because the tail is tilted at a slight angle to the body in this pattern, you can't go to the center of the tail, otherwise the loon's back would be off center. Next, draw two lines, 2¼" in from each side, from the front of the blank to just before the tail, following the contour of the body, not the centerline. Draw a line on the sides ¾" from the bottom to represent the water line, then draw another line 2" up from the bottom. Refer to the pattern and copy the side pocket contour onto each side of the blank. The purpose of the pocket contour line is to define the area just under the wing. Finally, draw a line on the bottom of the blank ⅝" in from the edge around each side of the blank.

The lines you have just drawn are used to guide the shaping. While you are completing the shaping, be sure to refer to the photograph to make sure you're maintaining the correct contours. Periodically step back and look at the bird from all angles. You may even want to place the head on the blank to see the full effect.

To bring out the overall shape of the loon's sides and wings, use your ½" or ¾" ball–nose carving bit to round the sides up from the line on the bottom to the waterline. Next, gouge out the side pockets approximately ½" deep at the top line, then take out the waste below until it is gently rounded and blends into the line drawn at the waterline. Be careful to leave the waterline markings, as this is the full breadth of the bird at this point.

With a rasp or draw knife, knock off the waste between the 2" line on the side and the 2¼" line on the back at about a 45° angle. Then, from the center line of the back to the wing pocket, begin rounding over the wings. Maintain a gently rounded top surface on the wing. Refer to the photographs to get the proper contours for the wing and throat areas, and finish roughing out these areas. The neck is tapered and each side slopes towards the water line. It should look as if water would flow right off the neck while the loon is swimming.

The cape is the triangular area between the wings just behind the neck. Gouge out this area ¼" deep and contour it as shown in the photos. Next, start from the center of the cape and gouge out a ⅜" depression down the center line out of the back until you reach where the tail surface begins. Roll each wing up and over into this depression so the wings look puffy.

Now that you have the wings roughed out, you need to shape the area for the tertiary feathers and the primaries, as well as finish the tail. The tertiary feathers step down about ⅛" lower than the shoulder feathers along the line indicated in the pattern. The tail drops down ¼" or so from the surface of the tertiary feathers and the primaries will ultimately rest on the tail surface. Carve out both of these contours with a ½" or ¼" ball–nose cutter and finish it off with traditional carving tools as required. Finally, shape and smooth the under side of the tail.

At this point, sit the loon on the table, walk around it and check out the lines of the carving, comparing it to the photographs. You may want to pick it up and feel all the contours and lines, as this is often the best way to make sure your carving has a natural, balanced feel. When you're satisfied that everything is right, sand all the surfaces smooth, leaving no tool or knife marks. You may wish to skip this step if you're using traditional carving tools for the texturing. The leftover grit from the sandpaper isn't at all friendly to the cutting edges of your tools.

Attaching the Head

The next step is to attach the head to the body. The head is set about 10° off the center line of the loon. Mark a spot in the center of the flat spot where the head will go. Drill a 3/16" dia. hole all the way through the blank at this point, then countersink with a ⅜" drill up from the bottom halfway through the blank to accommodate a #10 X 2½" FH wood screw.

Position the head on the body as indicated and make a reference mark by tracing the outline of the neck on the body. Remove the head and apply 5–minute epoxy to the mating surface, then replace the head and screw it on from below. Make sure the screw is tight and the head is correctly placed.

Once the epoxy has cured, remove any squeeze–out and fill the joint with plastic wood to blend the head in with the body so that it appears to be one piece and has a natural contour. When the plastic wood hardens, sand carefully to match chest, sides and back of the neck. Continue the stoning you started on the head and blend it into the chest area.

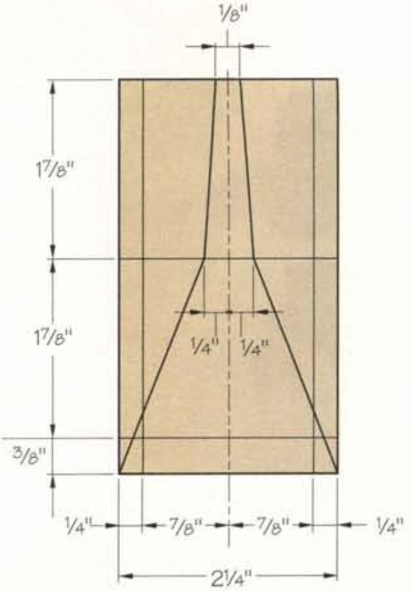
The Primaries

Cut out the primaries from 1/64" plywood using scissors or a hobby knife. There are four separate pieces for each side which are glued up after they are detailed to represent feathers. Start by burning the top of each feather shaft down each piece and then burn in the detailed lines. Once you have burned the top of each feather, repeat the process on the bottom side, however make the burns at intervals of about ⅛". This gives the feather some natural curve, but won't be seen. Finally, glue them together with wood glue, as shown in the feather figure.

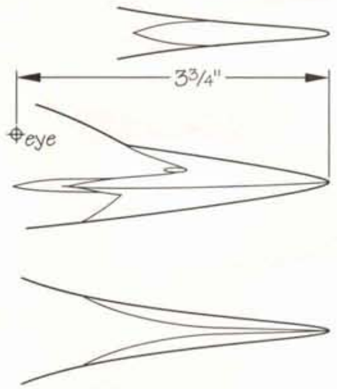
To install the primaries, gouge out a ⅛" deep pocket just behind the tertiary feathers. Make it just tall and wide enough for the glued up primaries to fit in. Don't glue them in until you have finished texturing and painting the body.

Texturing and Painting

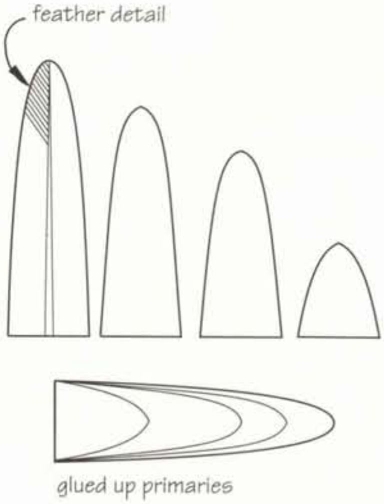
Once you have the loon fully shaped, it's time to start drawing feather patterns on the body in preparation for carving and burning in the feathers. The feathers on a loon are fairly square on the tips. On the wings, there are 14 rows of shoulder feathers and 4 rows of tertiary feathers. Draw these feathers on the body making sure that they are consistent but



the head



the beak



primary feathers

not identical. Use a ⅛" tear–shaped ruby cutter to shape each feather. Keep them puffy and take care to make them appear to overlap each other. The sides of the loon also require carved feathers using the same technique. Add the fine feather detail to each feather you have just outlined with a ¼" cone–shaped stone.

At the back of the neck, on the cape and down the middle of the back, draw small, off–set rectangles to represent small feathers. These feathers don't need to be highly detailed, so use the cone–shaped stone to texture them. Start above the tail and work your way to the front of the bird.

Next, draw four rows of tertiary feathers. Cut these in to a depth of 3/64" at a right angle to the surface of the wood so that undercutting does not occur. Again, vary the size slightly. Use a straight gouge and take out a small sliver around the profile of each feather. Take care to maintain the appearance of overlapping. Using the wood burning tool, burn the shafts into the feathers then burn in the fine detail.

Measure ½" back from the end of the tail and draw the feathers on both the top and underneath. Carve and detail these feathers as you did the tertiary feathers. The chest can be left smooth or textured with short stoning lines.

After all the shaping and texturing is completed, you will need to paint the loon. While some carvers believe that applying paint to wood simply ruins a carving, this style of carving is done with a wood that does not have any appealing visual characteristics, and is expected to be painted. The painting is done with very thin coats of paint, since thick paint will mask the texturing that gives it realism. If you can't get the coverage you expect, simply use extra coats instead of resorting to thicker paint.

You'll need to seal the wood with Gesso before applying the paint. Take a fair amount and mix it with water to make a very thin mixture. Apply two coats and rub them down between coats with Scotchbrite™ to remove any raised wood. Use a toothbrush to remove any leftover particles after this process.

Mix Mars Black with water until you achieve a thin paint. Add a small amount of Burnt Umber until it shows a slight brownish tinge. Use a stiff brush to make sure you get the paint into all the crevasses and details. Apply two or more coats until the white gesso is covered. Rub down with Scotchbrite™ in between the first and second coat only and brush off any residue with a toothbrush. Paint everything except the chest and from the water line and down.

Mix up some Mars Black with water (about ⅛ to ¼ in a baby food jar) Add four 'toothpicks full' of the iridescent green and violet powder. Give the head two coats of this mixture and allow it to dry between coats. If you don't begin to see the iridescence in the first coat, add more powder for the second coat.

For the chest and area below the water line, mix a good amount of Titanium White along with a small drop of Mars Black in water until you have a thin coat. The Mars Black tempers the brilliant color of the Titanium White paint. Paint the remaining white areas, being careful not to paint over the black areas.

You will want to give the beak a little bit of contrast for emphasis so mix a drop or two of Titanium White with Mars Black and water. The color should be a very dark gray. Apply two or more coats to the beak as required.

The tail feathers and primaries should be a painted with a mixture of Burnt Umber and water with a small drop of Mars Black to bring down the tone. Apply two or more thin coats.

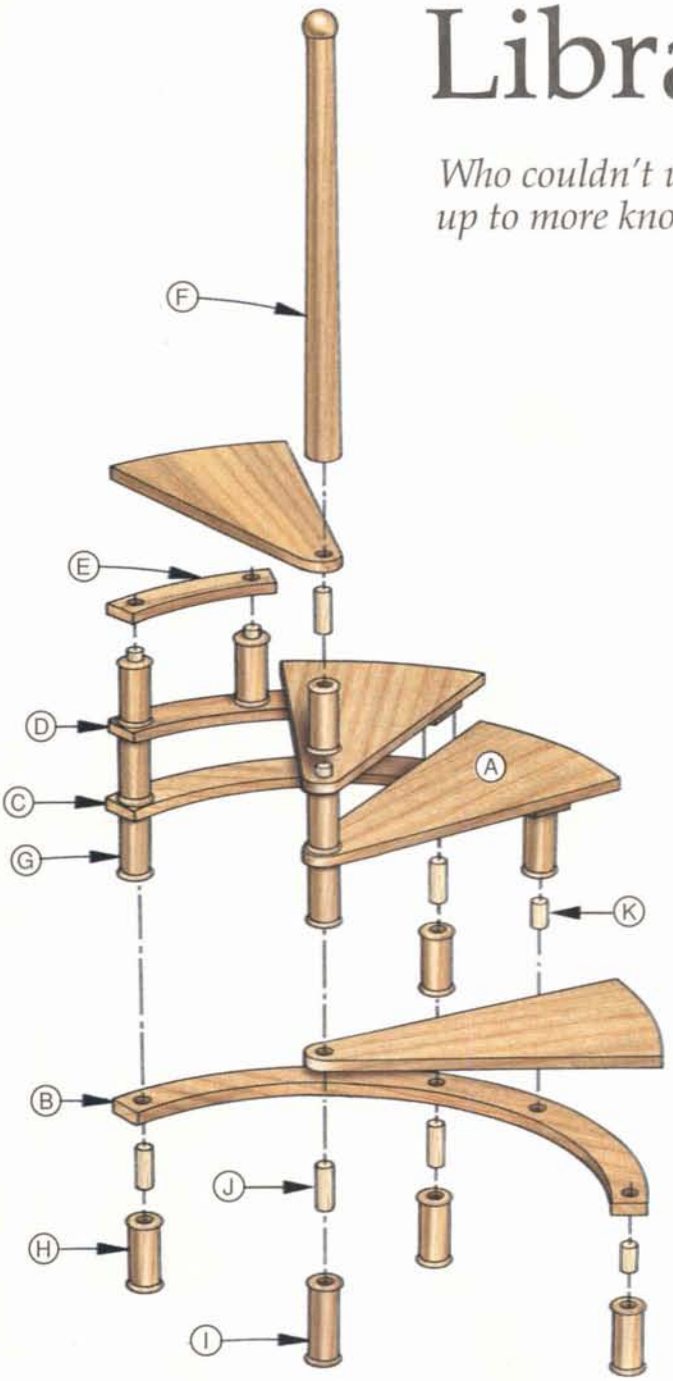
Using more of the Titanium White and Mars Black mixture and a fine tipped brush, paint the white accents on the body. Again, use two or more coats as required to fully cover the black base paint. This final painting step adds valuable identifying features to the loon, and should be done with care.

Once you're satisfied with all the detailing and painting, glue in the primaries with epoxy and wait until dry.

Realistic decoy carving can be a very detailed, exacting craft if you are striving for complete realism, or entering carving competitions. This article outlines how to carve and paint a loon which is as realistic as most casual carvers would want, however if you are interested in exact detailing, you should check your local library or stores for books on the loon and incorporate your observations of the details into the project. Even if you aren't interested in using the books as references for your carving, you are sure to enjoy them anyway.

Library Steps

Who couldn't use a step up to more knowledge?



Library Steps

Cutting List

		Rough Size			
Qty	**Prt**	**T**	**W**	**L**	**Piece**
4	A	¾"	9½"	19½"	steps
1	B	¾"	10⅞"	32"	stringer
1	C	¾"	7⅛"	26¼"	stringer
1	D	¾"	4⅜"	18⅝"	stringer
1	E	¾"	2⅝"	9¼"	stringer
1	F	1⅞" diam		23"	handhold
10	G	1⅞" diam		4"	spacers
3	H	1⅞" diam		4"	feet
1	I	1⅞" diam		4¾"	center foot
8	J	¾" diam		2½"	dowels
7	K	¾" diam		1½"	dowels

by Jack Cornish

Even if you don't have any books on high shelves, these library steps make an attractive plant stand. Simple to make and economical of material, it's an interesting conversation *piece* when completed. I used chestnut, now a rather rare wood but any clear hardwood will be satisfactory.

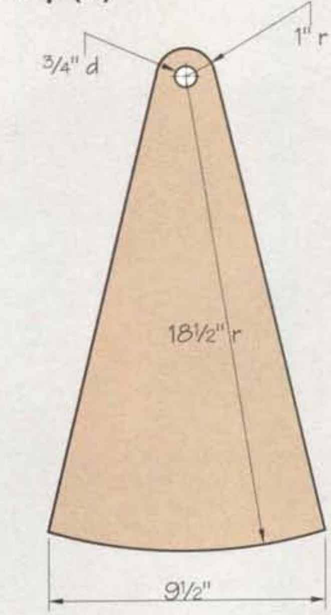
Begin construction by transferring the step pattern from the next page to your stock. If you have a taper jig for your table saw, the sides of the step can be cleanly cut on the table saw; otherwise, cut out the four steps (A) on the band saw or with a jigsaw. Clean up the cut edges with a belt or disc sander. Stack drill the ¾" diameter hole in the steps as located on the pattern. By stack drilling all of these holes at once you will assure a uniformity of appearance in the final piece.

Transfer the stringer (B), (C), (D), and (E) patterns from the facing page to your stock, then cut out their profiles on the band saw or with a jigsaw. True up the outside radii of the stringers with a belt sander, and the inside radii with a spindle sander. The larger the diameter of the spindle sander drum the better it is for this job. Referring to the exploded perspective above, stack drill the ¾" diameter holes in the stringers where they align vertically. This helps in maintaining accurate alignment of the spacers, feet and stringers.

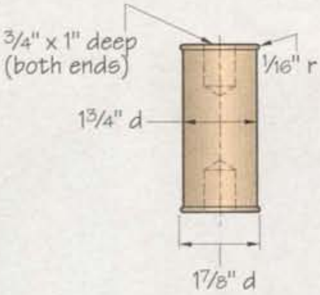
Turn the handhold (F), spacers (G), feet (H), and center foot (I) on the lathe to the dimensions given in the fig-

***Jack Cornish**, now retired, used to own an antique restoring and refinishing business in St. Louis, Missouri.*

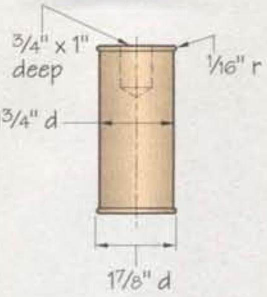
step (A)



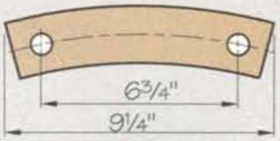
spacer (G)



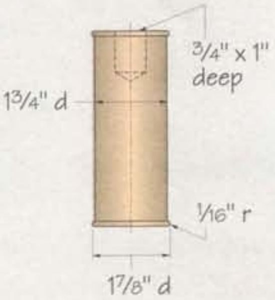
foot (H)



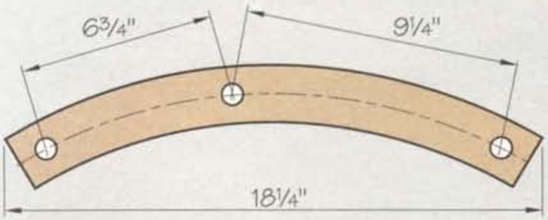
stringer (E)



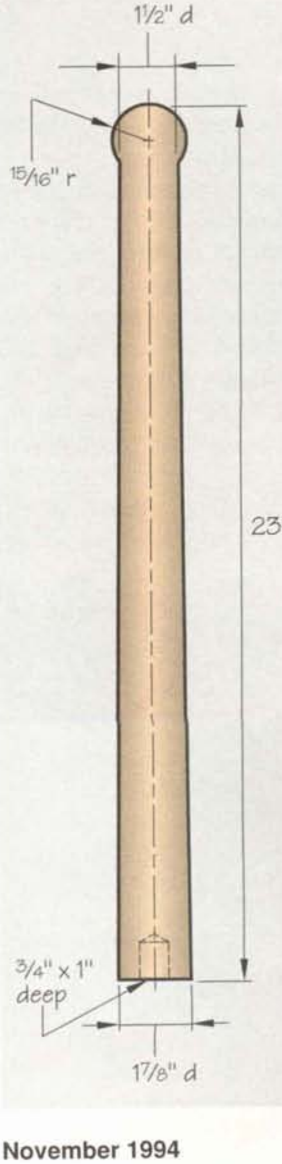
center foot (I)



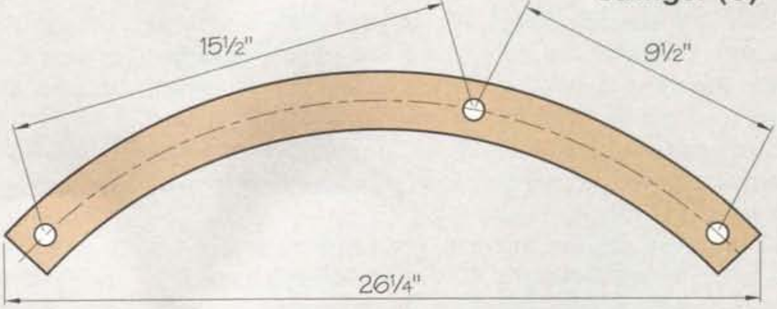
stringer (D)



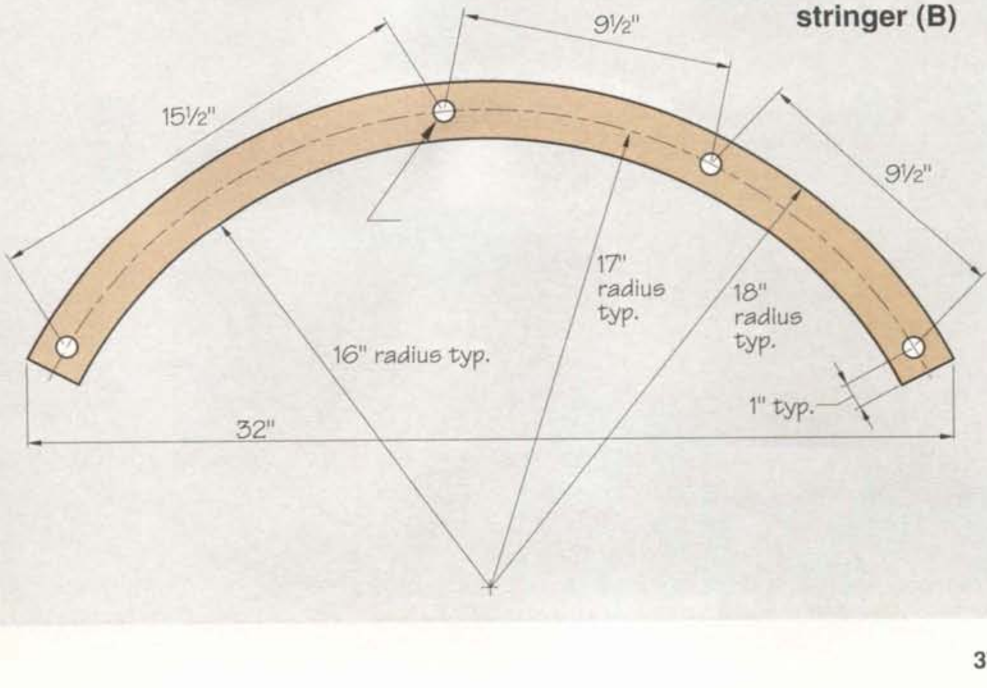
handhold (F)



stringer (C)



stringer (B)



Clamp the steps together and line–drill the holes for proper alignment.

Ease the edges of the steps with a 1/8" radius.

ures on the preceding page. It is easier to turn several of the short pieces at the same time. Allow some excess and cut to length partly through with the parting tool. Finish cut them on the table saw. Drill all of the dowel holes, shown in the patterns, on the drill press for accuracy of alignment. Sand all parts smooth with progressively finer grades of sandpaper.

The handle, spacers, feet and center foot are attached to the stringers with sections of 3/4" diameter dowel (J) and (K). Use the longer dowel sections (J) where necessary to pass through the stringers or steps to join two spacers, or a spacer and a foot, or a spacer and the handle. Use the shorter dowel sections (K) where there is a step on top of the stringer instead of a spacer. Dry–assemble the library steps without glue or fasteners. This allows you to be sure everything fits together and to make any necessary adjustments.

When everything fits cleanly, take the assembly apart and reassemble with glue on the dowel joints. If you are not using grooved dowels, sand a small flat on the sides of the dowels to allow glue and air to escape as the dowels are pushed into the holes. Fasten the steps to the stringers with two #10 X 1 1/4" flat head wood screws for each step. Drill pilot holes and install them from below the stringers. To complete the library steps, I used Deft™ clear wood finish, which is self–leveling and looks great whether applied with a brush or spray. PW

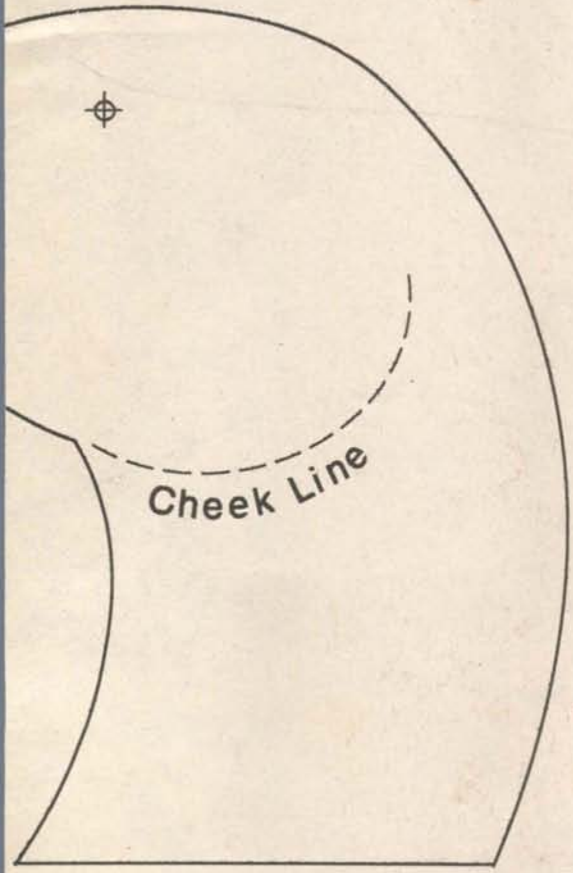
Finish sand all the turnings while they are still on the lathe.

Drill the holes in the turnings on the drill press.

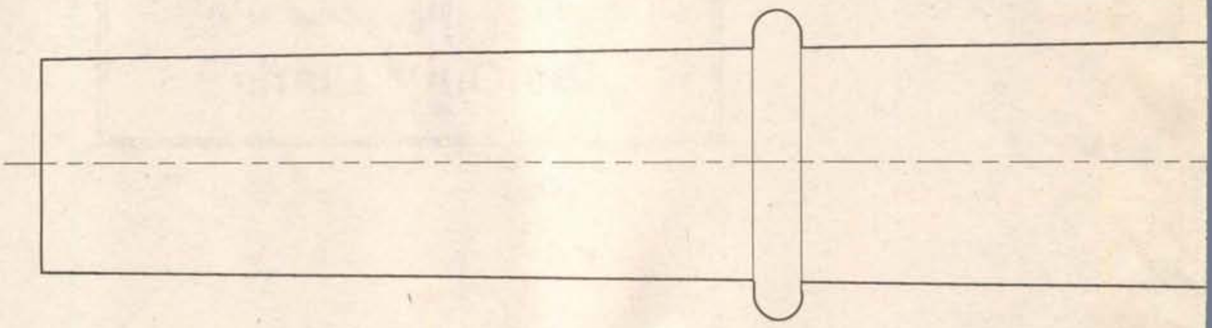
Popular Woodworking No. 81

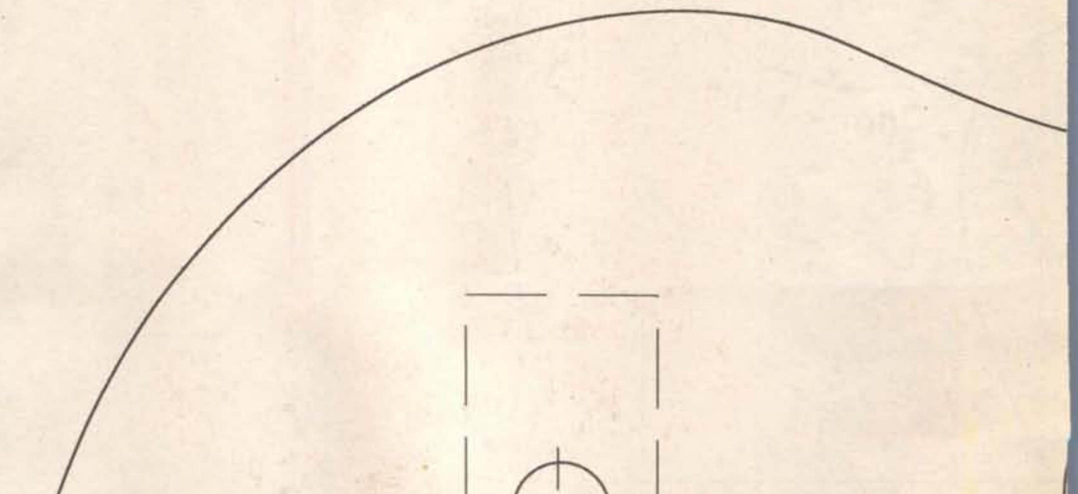
November 1994 (pages 43-58)

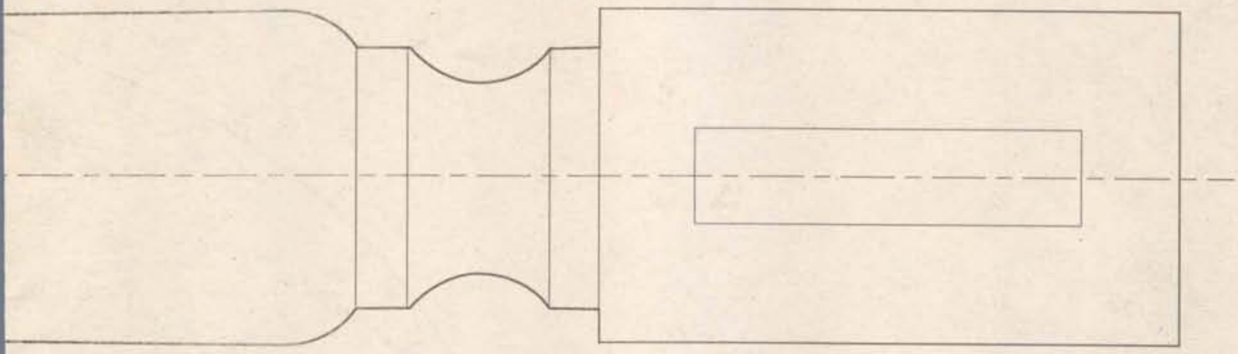
PullOut™ Plans

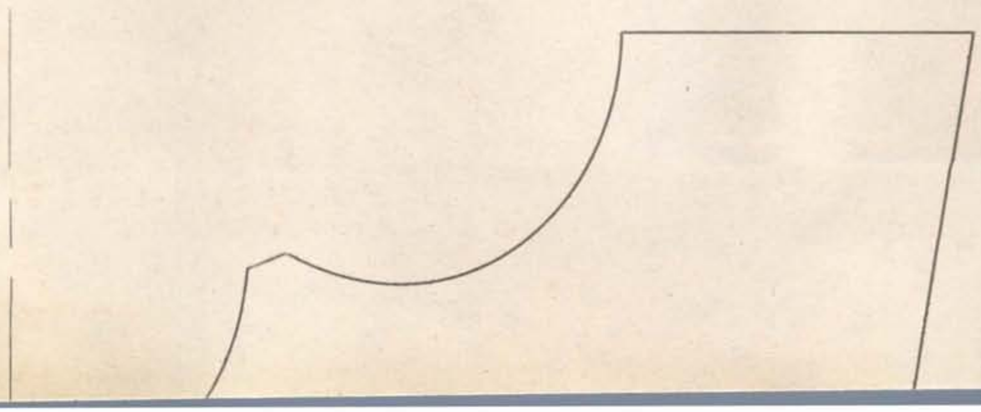


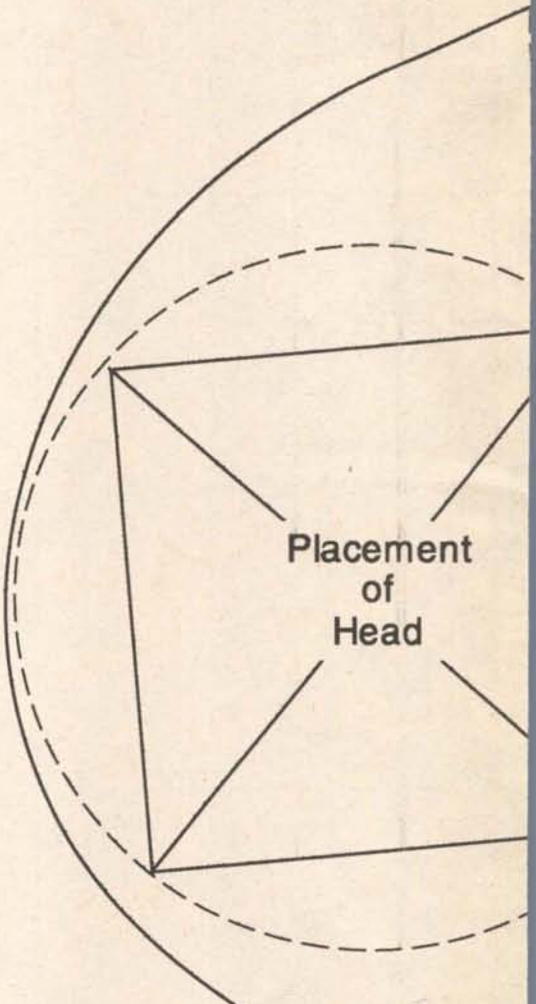
Loon Head
side view










Placement
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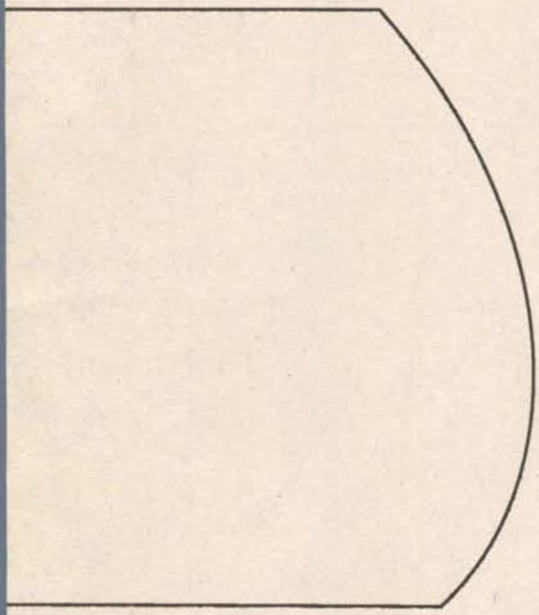

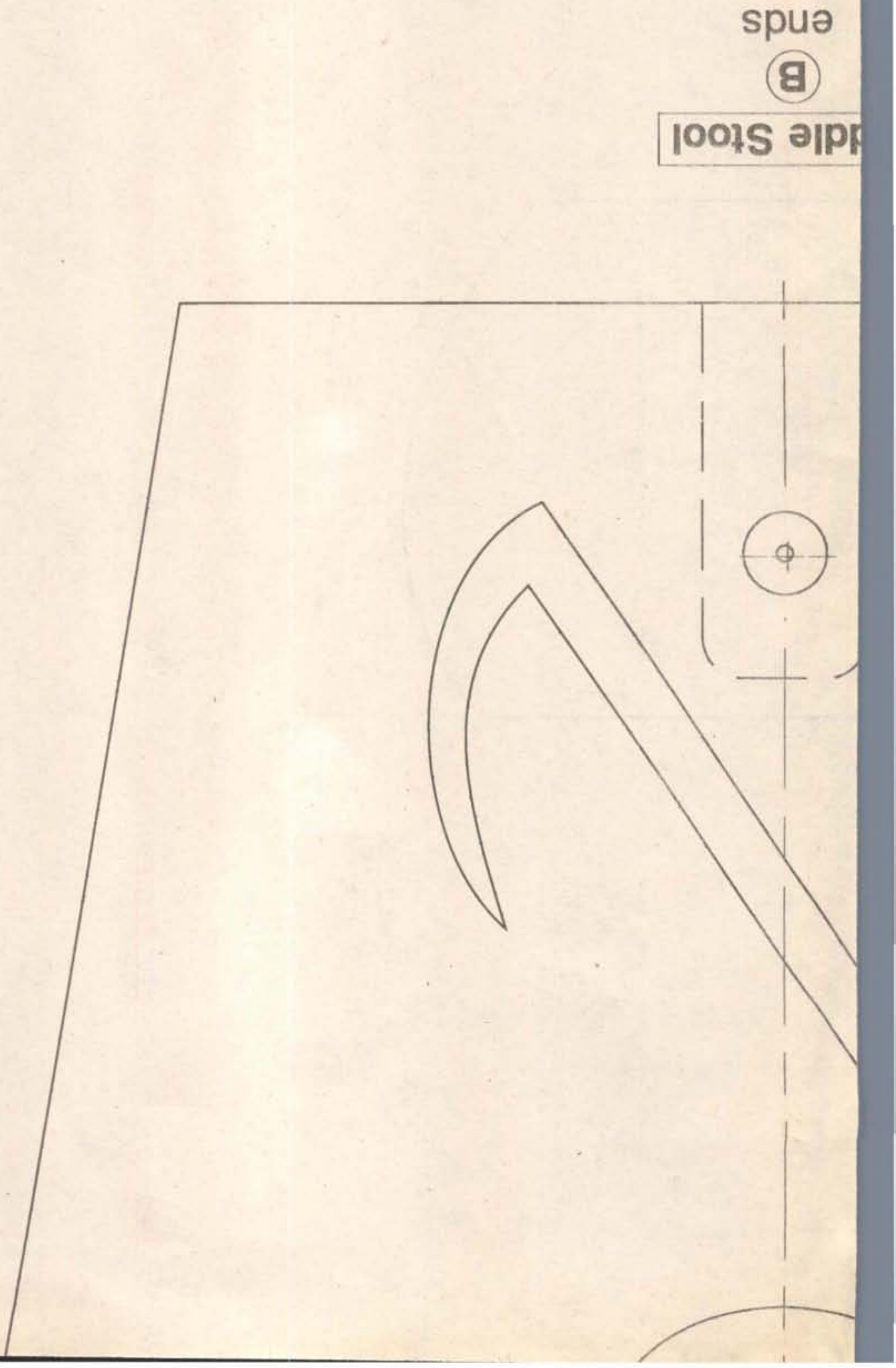
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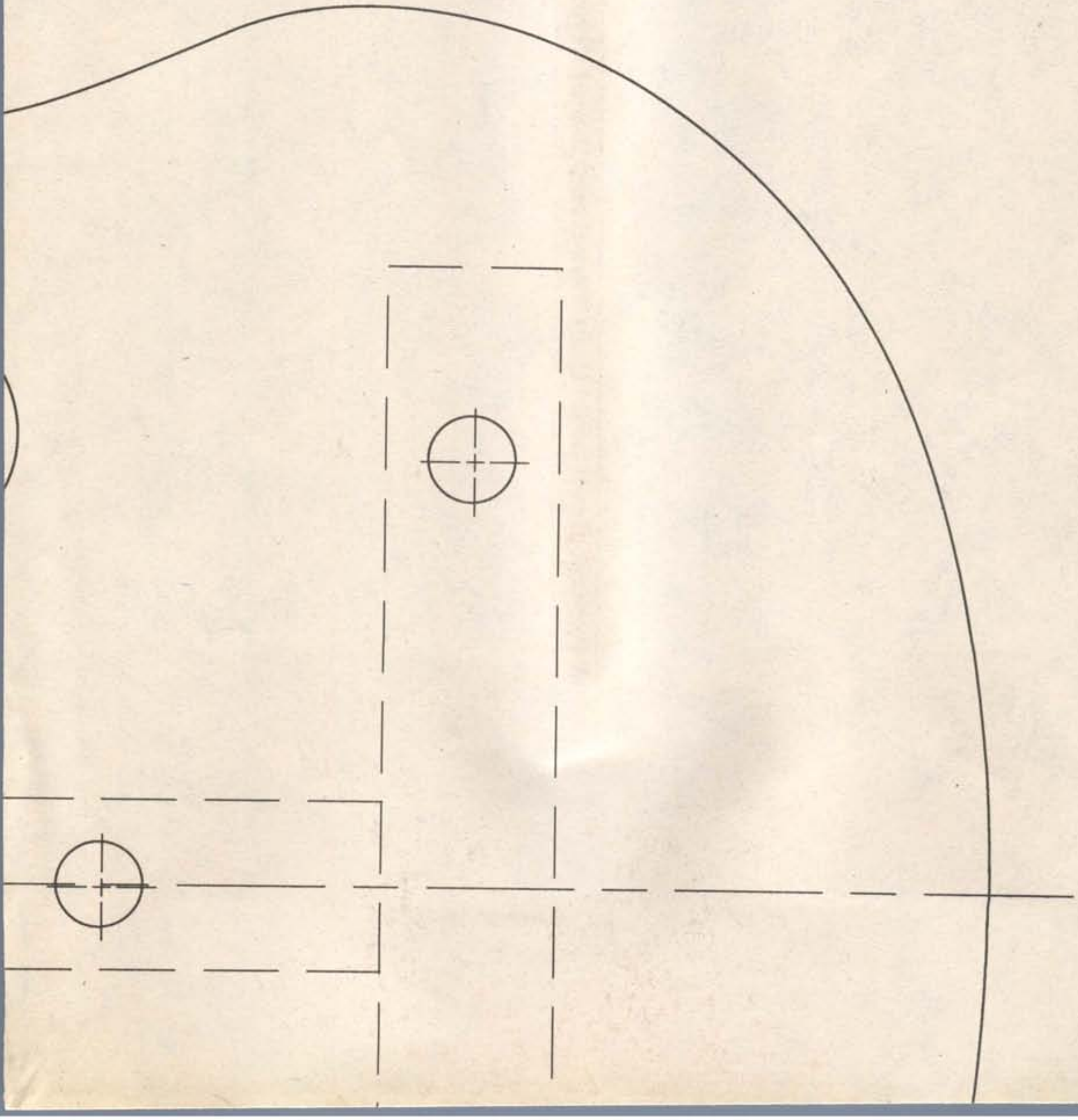
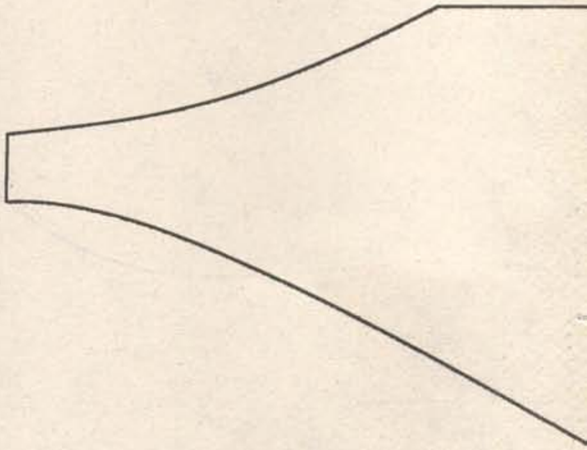
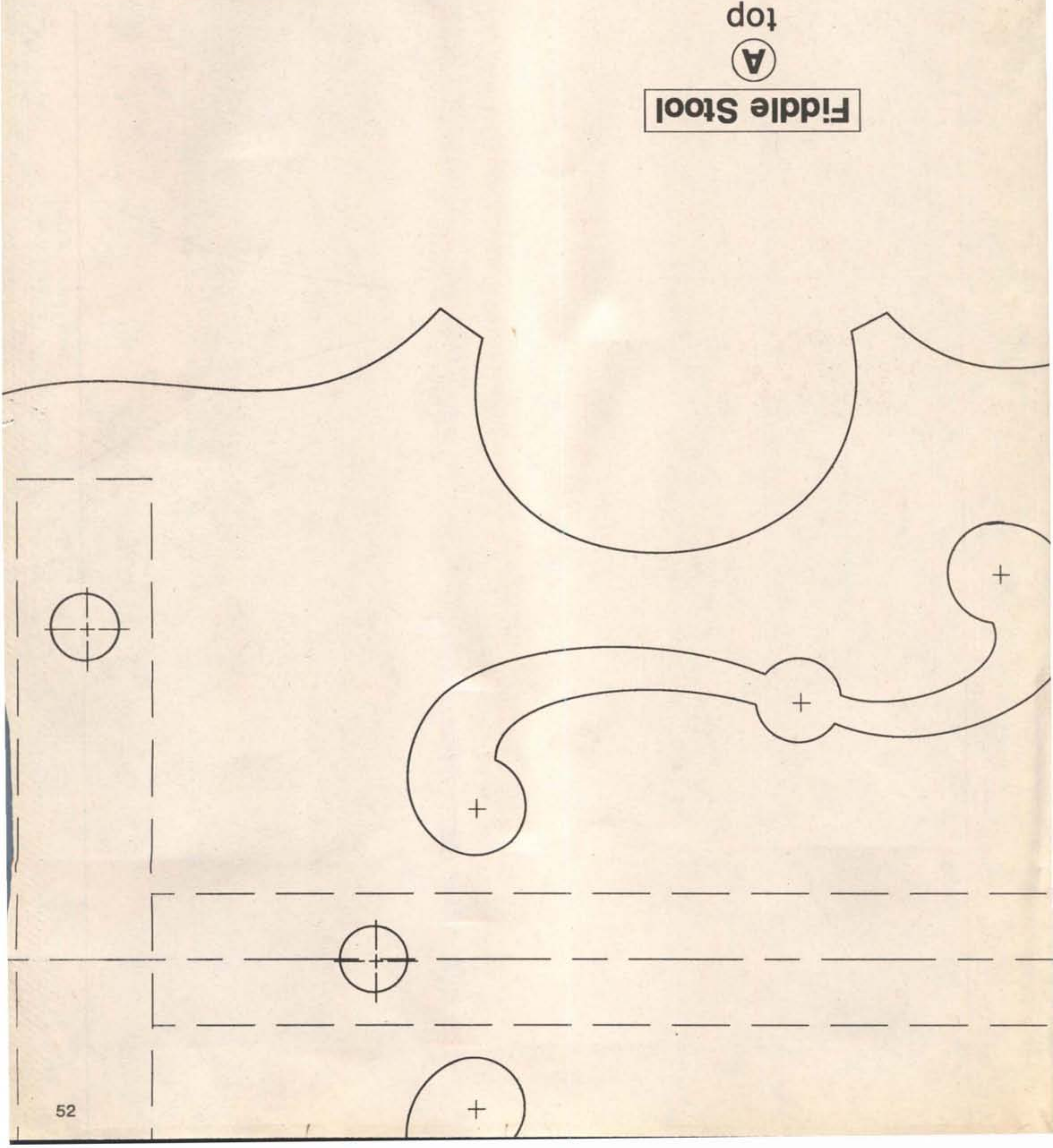


Carefully open staples to remove plans, then bend them closed again.




Fiddle Stool
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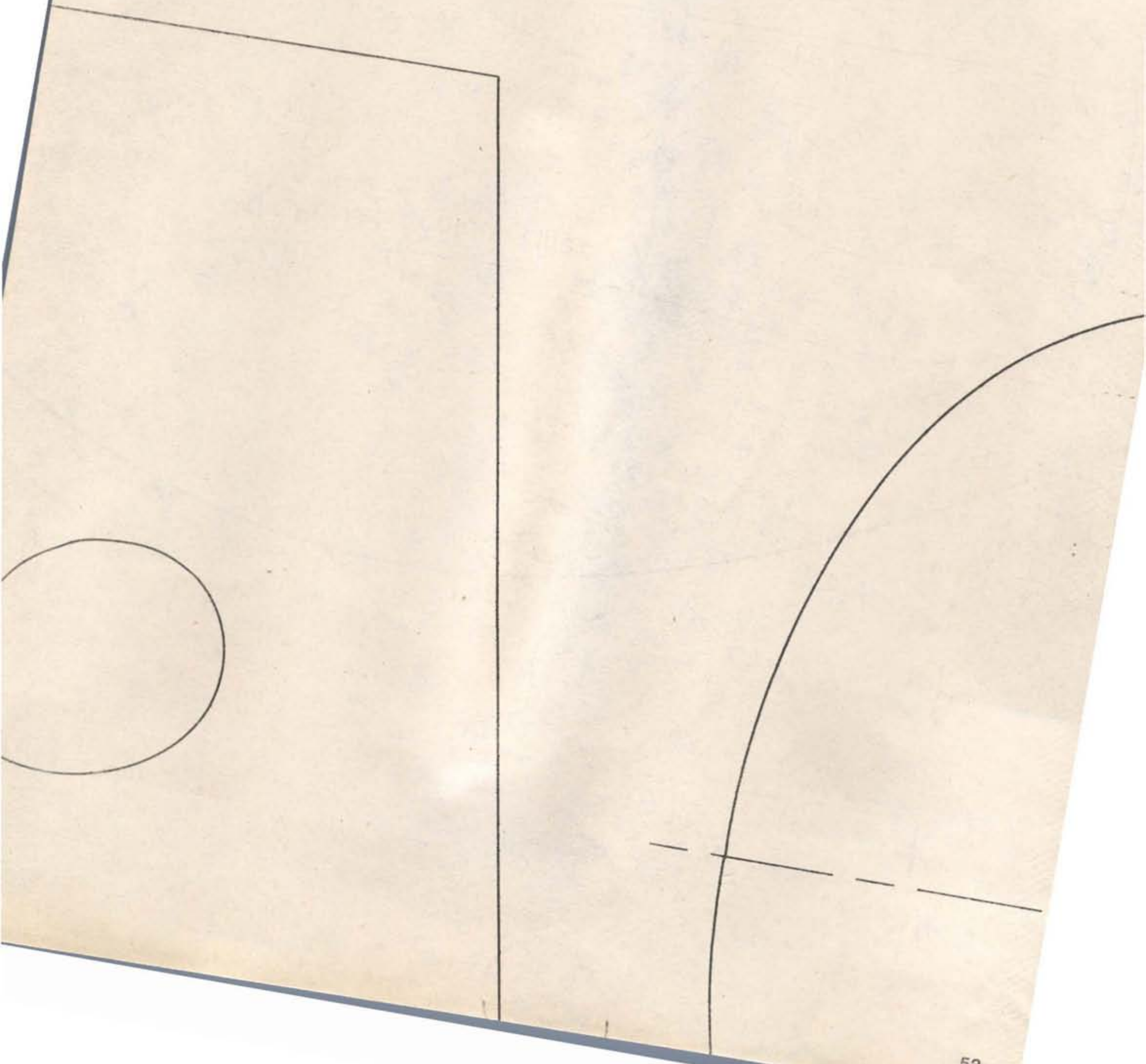
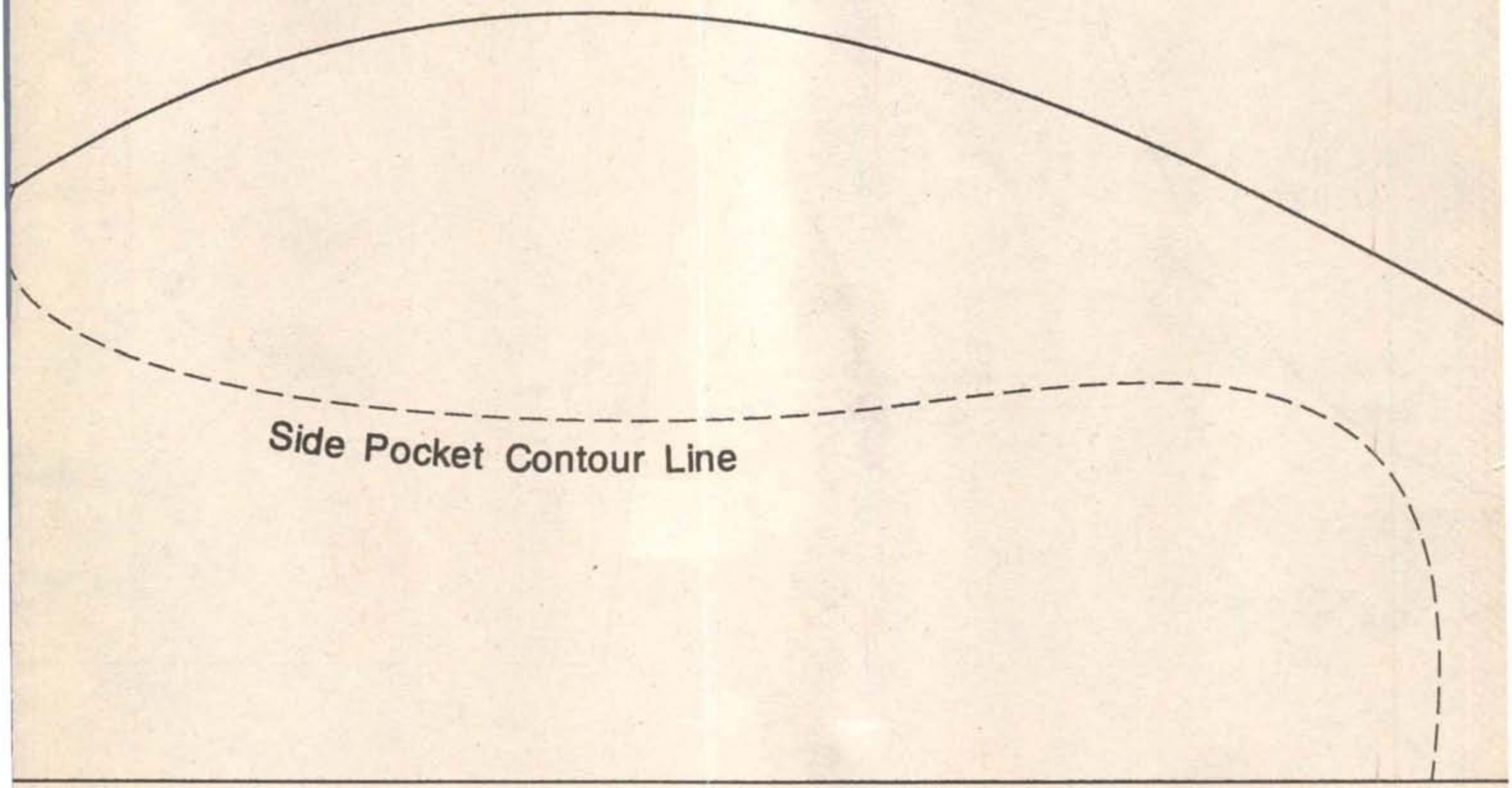
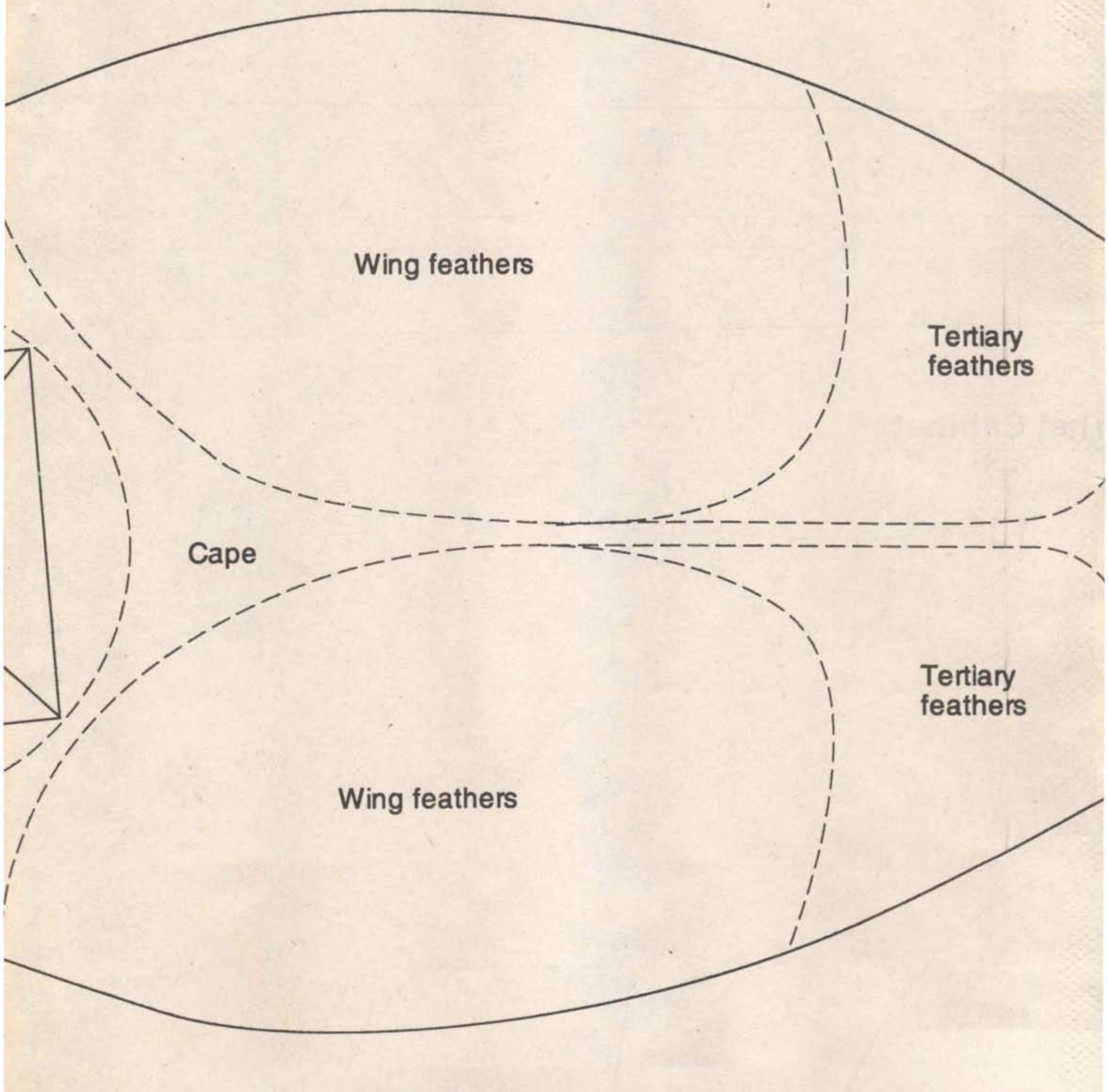
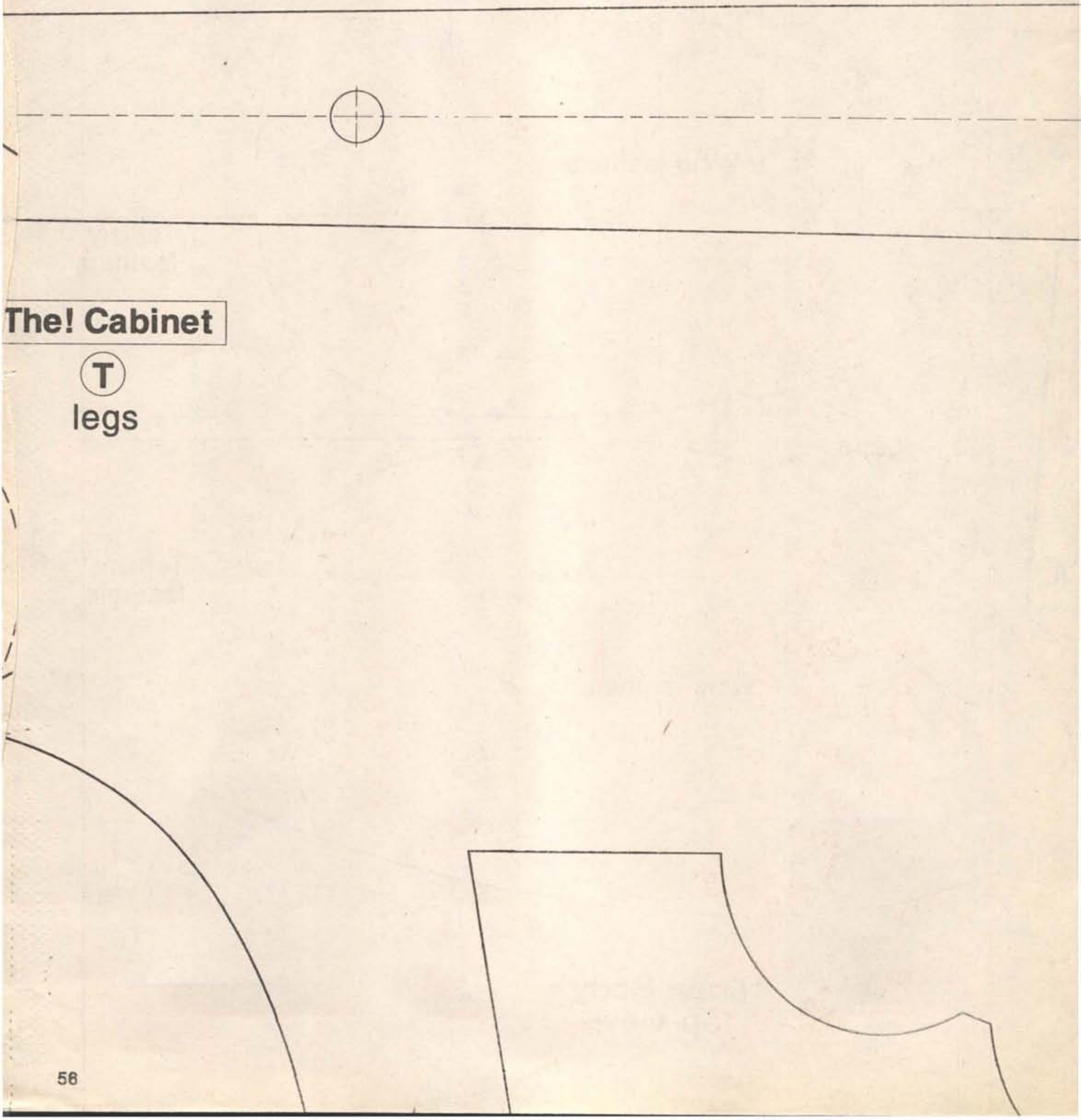




Loon Body
side view



Loon Body
top view


The! Cabinet
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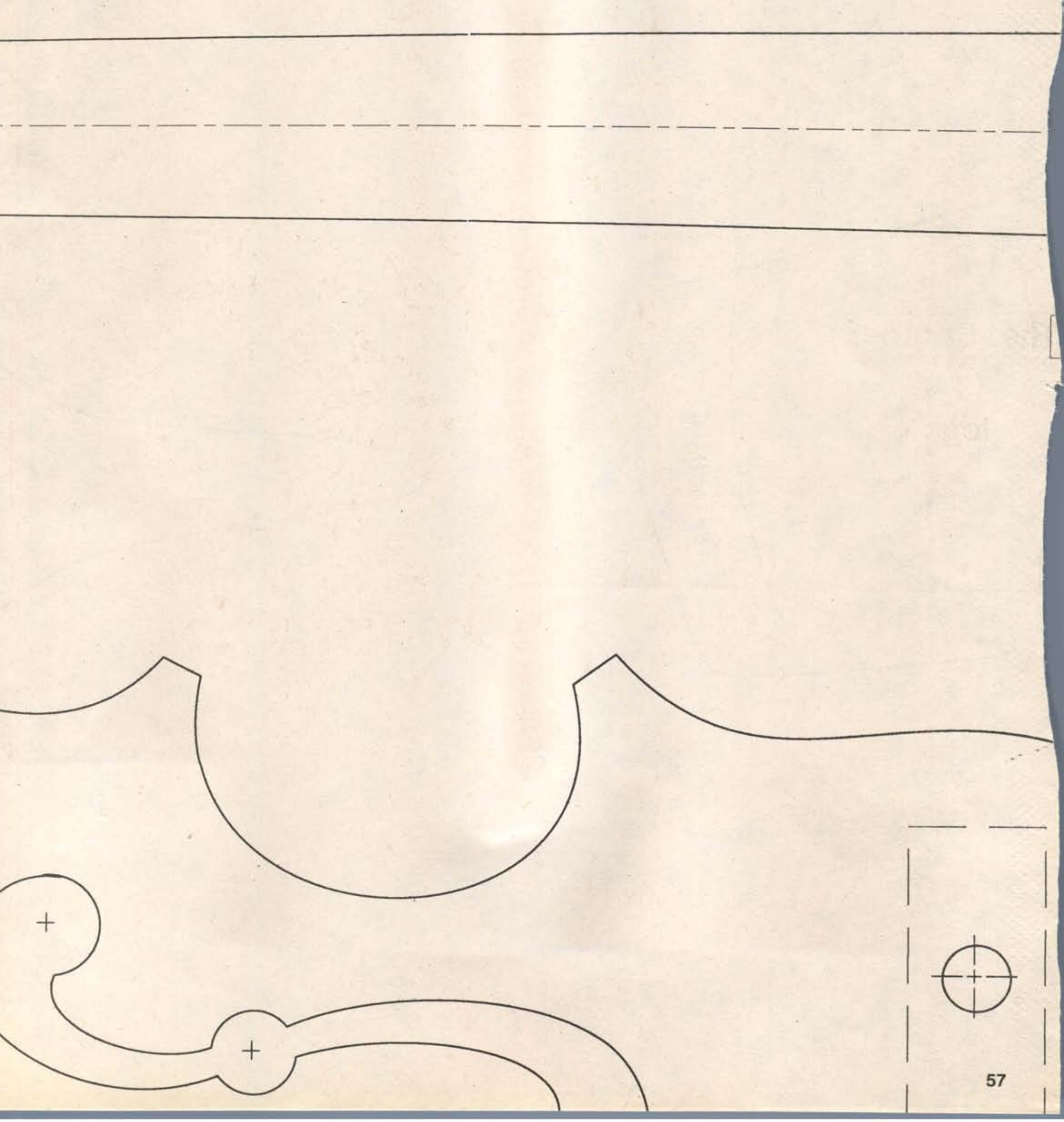
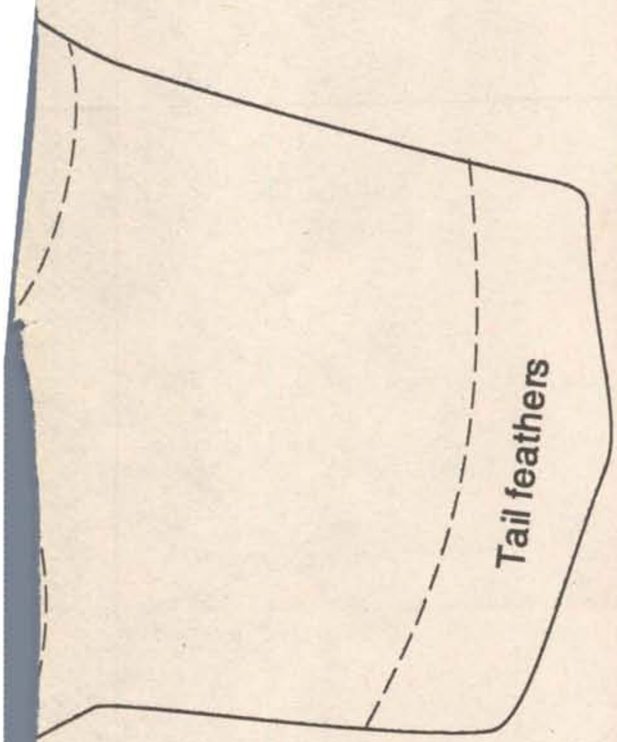
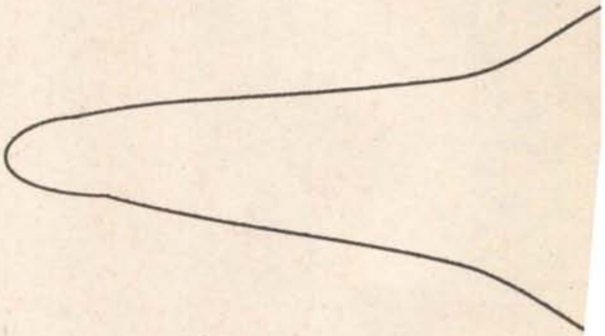


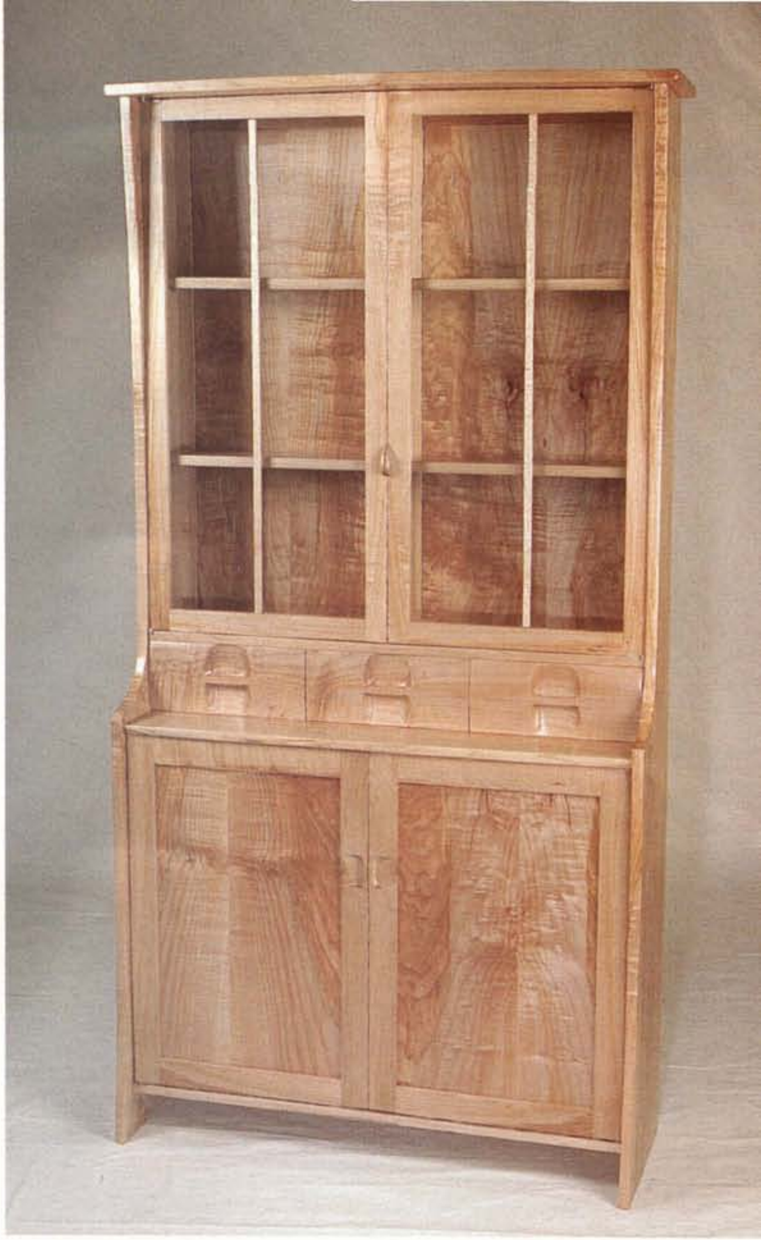

Tail feathers



A Master Craftsman Project

The! Cabinet

Ken Sadler's projects can be a challenge to build, but editorial assistant Andrew Ilsley was rewarded in the end by his own sense of accomplishment, as well as the admiration of the staff. This was his first large project.



by Ken Sadler

The! Cabinet was designed for an automobile dealer with a strong interest in classic cars. He had several folios about these classics and wanted to be able to display some and store the rest—all in one piece of furniture. As a consequence, the original cabinet had a series of racks behind the glass doors to display several folios. The lower, solid doors concealed a couple of shelves to store the rest. I included the drawers because the design needed a strong horizontal line somewhere near the middle. Besides, I had an idea for carved drawer handles that I wanted to try. Just before delivering the piece, I put it in a gallery show. The fellow was sufficiently pleased with it that he brought all his friends to the show to see it. In this version I've replaced the folio racks with two adjustable shelves that will allow you to display some of your treasures. Building The! Cabinet could expand your skills and you may find several ideas that are perhaps, new to you. In any event, this project should keep you pleasantly occupied for a month or so and when it's finished, you too will have something to proudly show your friends.

In this project there are three areas where appearance is paramount; the sides, the lower door panels and the drawer fronts. The sides should be cut from one board, or each should be chosen for a grain pattern that creates the illusion of being cut from one board. It's ideal if the flow of the grain lines follow the curves in the front edge of the sides. The lower door panels look best if they are book–matched and similar in pattern. The drawer fronts should be made from one board that has grain lines flowing along its length.

You need to build the case first because everything else is measured from it. The drawings show nominal dimensions for the back panel assemblies, doors, and drawers, but the actual dimensions are taken from the case after you build it.

The Case

Each side piece is made by gluing up one 3/4" X 8" X 72" board and one 3/4" X 6" X 36" board unless you can find one single board that's wide enough. After the side glue–ups are dry, mark the outer surface of each piece with chalk and lay out the shape of the sides on that surface. Note that the upper and lower front edges are not straight lines, but curved. Band saw the shape shy of the lines and make sure that the back and bottom edges are square. Clamp the sides together with the inner faces touching and the back and bottom edges flush with each other. Clean up the cut edges to the line using a spoke shave. To lay out the centerlines for the dovetail grooves for shelves B and C and the bottom edge of the dado for shelf A, measure from the bottom edge of the side and mark each center line and the dado line at the outer ends as located in the side view drawing. Draw this line perpendicular to the back edge across both sides, and mark the length of each cut. This method will assure that when the sides are face to face the lines, and thus the grooves, are parallel. Cut the 10 3/8 X 1/2" deep sliding dovetail grooves for shelves B and C, with a 9° X 3/8" dovetail bit in the router. Cut the 5 3/4" X 3/8" deep dado for shelf A with a 1/2" straight bit in the router.

Cut a 1/2" X 1/2" deep rabbet *along the back edge* to accommodate the back panels as shown in the side view drawing. Notice that it runs out at the top but is stopped at the bottom of shelf C. Drill 1/4" diameter X 3/8" deep shelf support holes at the locations shown in the side view drawing.

Shelf A is made from a single board 3/4" X 6 1/4" X 38". Shelf B is made by gluing up two boards; one board 3/4" X 7" X 38" and the other is 5/8" X 5 1/2" X 38". When you glue up these blanks, use a squeeze clamp at each end to make one surface of the 5⁄8" board flush with a surface of the 3⁄4" board. Make shelf C by gluing up two boards 3⁄4" X 6" X 38". Relieve the front corners of shelves A, B and C with a 1" X 3⁄8" notch so the back edges of the shelves are flush with the interior edge of the back rabbet when dry fit into the sides. Cut a 1⁄8" X 7⁄8" rabbit on the top front edges of shelves A and C to make door stops.

To make the two top spreaders, start with boards that are 1⁄2" X 1 1⁄2" X 38". Cut the half–blind dovetail pins on the spreaders as located on the top view drawing. It's very important that the distance between the base of the dovetails on the spreaders and the end rabbets on shelf A are exactly the same. Draw a line down the center of each spreader from end to end and drill four equally spaced 3⁄16" holes along the line to later fasten the cabinet top. Counter bore the holes for #8 wood screws. For the cabinet top, start with a board that is 3⁄4" X 7 3⁄4" X 39 1⁄2". Mark the center of it's length on the front edge; then draw a line parallel to, and 1⁄4" from the front edge.

Using the tails on the spreaders, mark the pins on the top edges of the sides for the half–blind dovetail joints. Cut the pins and fit the spreaders. The sliding dovetails on the shelves should slide easily in the grooves. If they don't, you'll have a difficult time assembling the case. Be sure the distance between the base of the sliding dovetails is exactly the same on both shelves and the same as shelf A and the top spreaders.

Before assembling the shelves to the sides, drill the necessary holes and cut the mortises for the upper and lower door hinges. Doing this now is a lot easier and more accurate than doing it after the case has been assembled. The upper doors use 5⁄16" X 1 1⁄2" L–shaped knife hinges. On shelf A, place the hinge in position as shown in the detail drawing. Mark around it with a knife point making as deep a cut as you can. Cut the mortise to the depth of the thickness of one leaf of the hinge.

The hinges for the lower doors are different and unusual. The parts of this hinge are a 1⁄4" T–nut, a 1⁄4" NC X 1" machine screw, and a piece of 3⁄4" X 1⁄4" id copper tubing. The detail drawing shows how they go together, but first you need to do some work on the machine screw and then position and drill the hole for the T–nut. Cut off the head the screw, cut a slot for a screwdriver blade in that end, then put a point on the other end. If you have a lathe you can do this easily with a file and the point will be properly located in the center of the screw body. Lacking a lathe, you'll have to do it by hand in a vise. Now thread the screw into the T–nut from the back side until the point almost comes through. Hold the T–nut in position with the flat side down on shelf. Turn the screw in the nut until the point makes a strong mark on the shelf—do this on both ends of the shelf. Drill a 5⁄32" hole through the shelf on the drill press so that you're sure the hole is absolutely perpendicular to the face of the shelf. Place shelf B on top of and exactly matching shelf C, with the underside of shelf B on the upper side of shelf C, and clamp them together so that they can't shift position. Run the 5⁄32" drill through the hole you just drilled in shelf C and make a mark on shelf B. Separate the shelves and drill a 5⁄32" hole 3⁄8" deep on the mark you just made on shelf B. Go back to shelf C and enlarge the 5⁄32" hole to 5⁄16".

Dry–assemble the case and make sure everything fits as it should and that all the shelves and spreaders are square with the sides. Disassemble and place glue in the grooves, the dado and dovetail pockets for the spreaders, then reassemble and check again for square. Use bar clamps if necessary to hold everything in position.

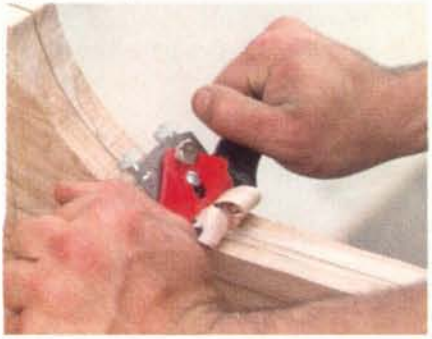
The Back Panel Assemblies

The overall dimensions for the panels are shown on the drawings, but they are only nominal and you should get the actual dimensions from the case. The top panel assembly fits in the rabbets in the sides and extends from just under the top to the middle of shelf B. The bottom panel is the same width and extends from the middle of shelf B to the bottom of shelf C.

Glue up the top panels to a rough size of 1⁄4" X 17 1⁄2" X 39" and the bottom panels to 1⁄4" X 17 1⁄2" X 26 1⁄2". Do not use plywood for these panels; resaw 1⁄4" thick boards from heavier stock and edge glue them to the sizes required.

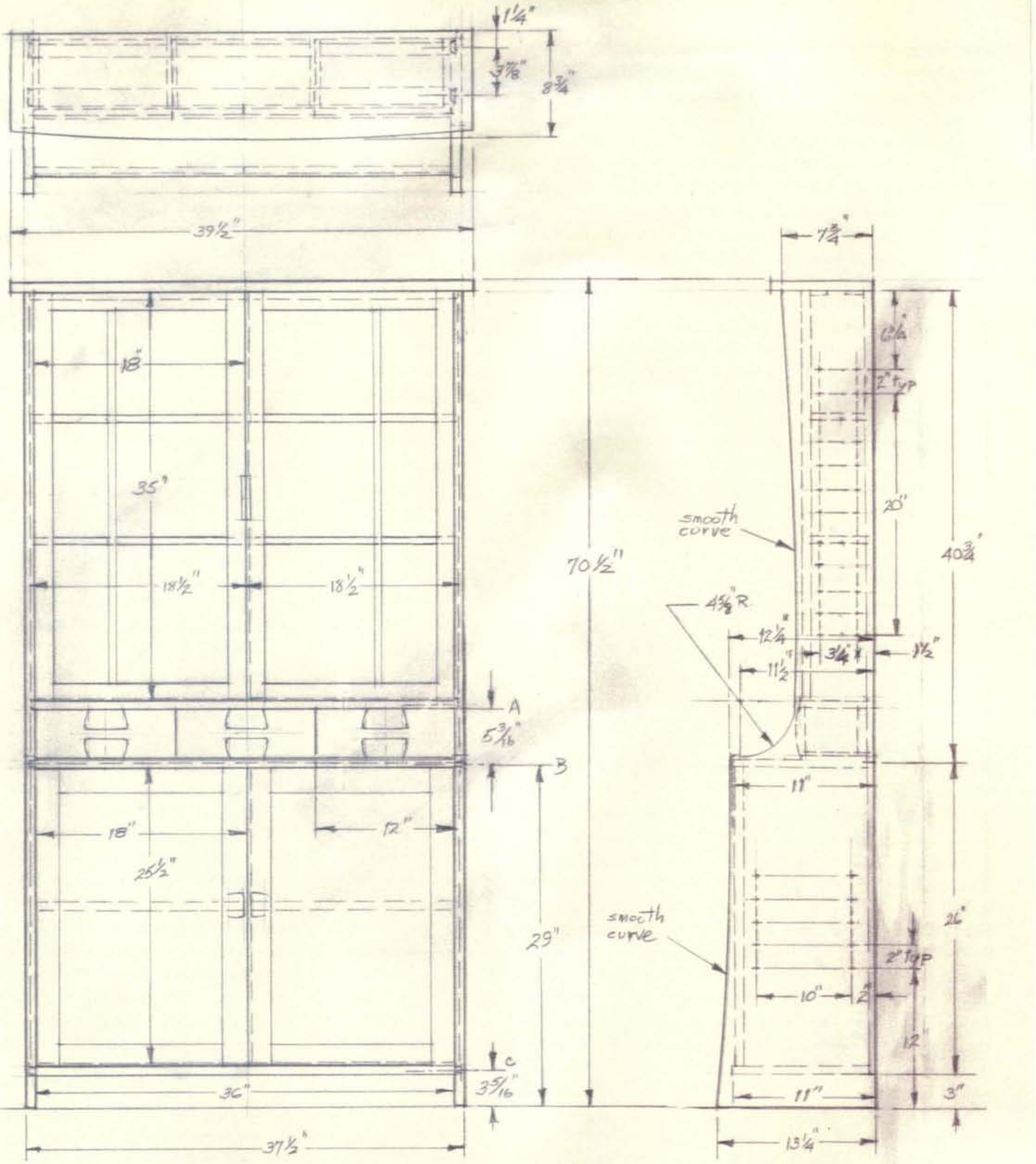
The back panel frames are made from 1⁄2" X 1 1⁄2" stock and are assembled with open mortise and tenon joints. The stiles of each frame are the full length of the frame and the rails are the full width. Measuring from the case, cut the stiles and rails for both frames. The panels fit into a 1⁄8" wide X 1⁄4" deep groove in the center of the rails and stiles. At this point mount a high auxiliary fence to your rip fence. Put one of the outer blades of your dado head on the table saw, set it for a 1⁄4" deep cut and set the rip fence to cut a groove in the exact center of the 1⁄2" edge of each frame member. Mark the outside face of all the stiles and rails and with this face against the rip fence, cut this groove in one edge of all the rails and the outer stiles. Cut the groove in both edges of the center stiles. Now, without moving the rip fence, raise the blade to

Clean up the contours to the lines with a spokeshave, then sand.



Ken's innovative drawer handles require patience and a sensitive touch.

Hand cut the dovetails in the drawer to retain the hand crafted feeling.



make a 1¼" deep cut, and with the marked face against the rip fence and the stiles standing vertically on the saw table, cut the open end mortises on all the stiles. Cut the tenons with a ¾" wide dado head with the rails laying flat on the 1½" wide face. Set the rip fence 1½" from the far side of the dado head. The depth of cut depends on the thickness of the mortise. Remove the waste from both faces to get tenons that fit into the mortises you cut in the stiles. Use a piece of the ½" X 1½" stock for the frame members and make trial cuts until you get it right—then make the cuts on the rails. By doing it this way, all the tenons, including the center one, are the same thickness (even if it's too thick or too thin).

Fit the frames together and square them up. Make sure they fit in the case properly. Measure the distance—side to side and top to bottom—between the bottoms of the grooves. Reduce the length and width by ⅛" each for the final dimensions of the panels. Starting with the rough panels, plane them smooth, then cut them to size. Put a ⅜" wide rabbet on all four edges deep enough to allow the panel to fit easily in the grooves in the frames. As with the tenons, take a piece of waste panel stock and make trial cuts until you get the proper fit, then do the panels.

Dry–assemble the frames with the panels. Make sure that all joints go home properly and that the assemblies fit in the case. When you're satisfied all is right, take them apart and apply the glue. Glue is applied to the joints only. The panels must float free in the frames to accommodate expansion and contraction due to changes in humidity. When applying glue to an open mortise and tenon joint, put the glue only in the mortise and only on the top half of the sides of the mortise. Put the joint together from the top down or the bottom up, never from the sides in. This way, it wipes the glue down over the bottom half of the sides and you'll have little chance of squeeze out. If you do it from the side, you'll push the glue out of the joint and all over the outside of the frame. Assemble the frames and panels, square them up and clamp if necessary. When they've dried, mount them in the case using #5 X ⅜" flat head brass screws—five on a side for the top assembly and four for the bottom assembly. Use four screws across the top and bottom of each panel.

The Upper Doors

The rails and stiles for the upper doors are ¾" X 1½". To determine their length, measure the height of the opening in the case and subtract twice the thickness of the little washer between the blades of the knife hinge. The length of the rails is one–half of the distance between the sides. The door frames go together with open end mortises like the back panel frames. However, there's no groove on the inside edges. Instead, there's a rabbet for the glass that you'll cut after the frames are glued up.

To begin, mark the inside face of all rails and stiles. Cut the mortises in the stiles in the same manner as before. Put a ¼" wide dado cutter on the table saw with the depth set at 1½". Set the rip fence (with the high auxiliary fence attached) to make the cut in the exact center of the ¾" edge of the stile. With the marked face against the fence, cut the tenons the same way you did on the back panel frames. Again, use a trial piece to get the proper thickness of the tenon. Make it an easy push fit. Dry assemble the frames and fit them in the opening in the case and check them for square while they're in place. If they're not square, find out why and either correct the problem or compensate for it now. When all is as it should be, put glue in the joints, clamp if necessary and put the assembly aside to dry.

While the glue is drying, make the glass stop–strips and the mullions. The mullions float and are not mortised into the frame. Make two strips, each the length of the door frames. The glass stop strips are ⅛" X ⅜" cross section. Make four strips the width of the frames and four the length of them. Round over one of the ⅛" edges. When the frames have dried for 24 hours, cut the ¼" X ¾" deep rabbet on the inside face of each frame. Do this with the router in a router table so you'll have better control of the cut. Square the corners with a chisel. Determine which is the top of each frame and mark it, also mark the inside stile of the right hand door. Cut a ¼" X ⅜" deep rabbet on the back inside edge of the inner stile on the right hand door. For clearance when closing the door, slightly bevel the edge of this stile from front to back as shown in the detail drawing. Cut a ¼" X ⅜" strip the length of the left hand inner stile and glue it in place flush with the back edge of the stile.

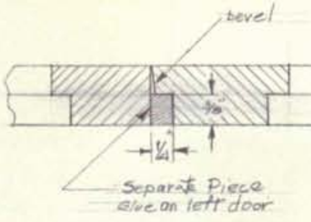
Place the hinges in position on the upper doors and mark them with a sharp knife. When making the mark, cut the line as deeply as you can. Now cut the mortise a depth equal to the thickness of one leaf. When the hinges have been fitted, screw them in place, then remove the top hinge.

The glass stop strips are held in place with #3 X ½" round head brass screws which require a 7⁄64" body hole. Drill three along the rail strips and four along the stile strips. Put the top and bottom glass stop strips in place (no screws) and cut the mullions to fit between them. Put the mullions in place against the face of the rabbet for the glass and mark the face of the mullion for the height of the rabbet; then trim this part of the face back to the edge of the glass groove.

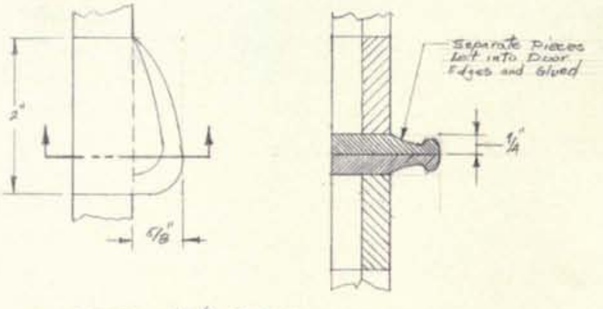
When it comes to glass, I never try to cut my own and I suggest that you shouldn't either—take it to a good glass shop. If they crack a piece while cutting it, it's their problem. Take the frames and the mullions (not the glass stop strips) to the glass shop, show them how it works and have them cut the glass to fit. Tell them you want the thinnest glass they have. When you get them home, mark the pieces so you know which frames they're for and set them aside where they won't get broken.

The frames are now ready to be fitted to the case. You have already cut the mortise for the bottom hinge. The mortise for the top hinge goes in the cabinet top. On the underside of the top, mark the corners of the front spreader and the sides with a sharp pencil. Remove the top and lay it underside up on the bench. The back edge of the shelf rabbet and the line drawn on the top against the front spreader are the same with regard to positioning the hinge. Position the hinge, mark it and cut the mortises as for the lower hinges. Screw the hinges in place and reinstall the top. To install the doors, open the hinges on the door and the one on the top. Tip the door slightly and fit the lower hinge in its mortise, then slide the upper hinge into its mortise. Drive the screws into each hinge. Do this on both doors, then see if they close properly. If they don't, make adjustments until they do. To make sure that the doors stay closed, put a ¼" bullet catch under the right hand door. Set it under the center of the bottom rail about 1" from the mating edge of the inner stile.

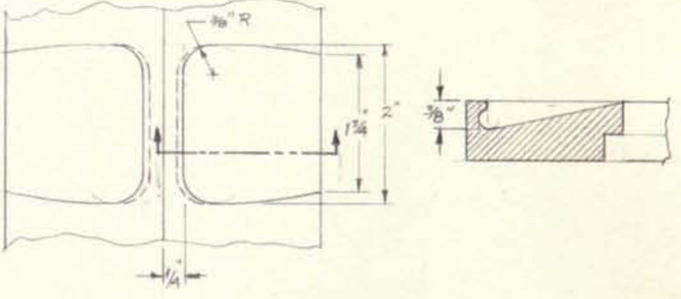
The last step on the upper doors is to make and install the handles. I consider handles a personal thing. Look at the handle in the drawing as my idea of what they should look like. If you like them, then use them, if you don't, please design and install your own. My design requires quite a bit of hand work. You can band saw the rough shape, but from there on it will take some carving tools, riffler files, sandpaper and careful work. Whether you use mine or yours, they should be placed slightly above the vertical center and in the horizontal center of the inner stiles. I suggest that you don't install the glass until you've done the final finishing of the piece. When you do, the glass stop strips protrude beyond the frame face by the thickness of the glass.



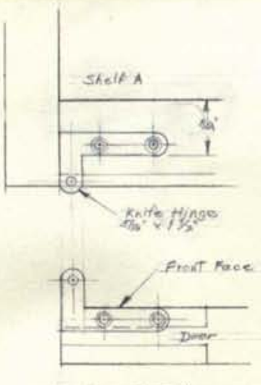
Door Overlap Detail



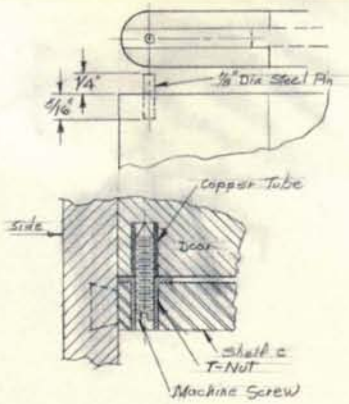
Top Door Handle Detail



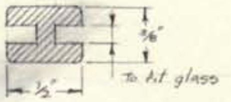
Lower Door Handle Detail



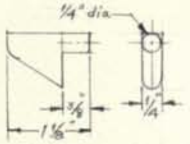
Top Door Detail



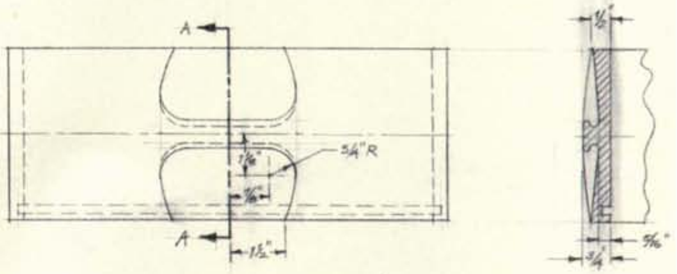
Lower Door Detail



Floating Mullion Detail



Shelf Support Detail



Drawer Detail

The Lower Doors

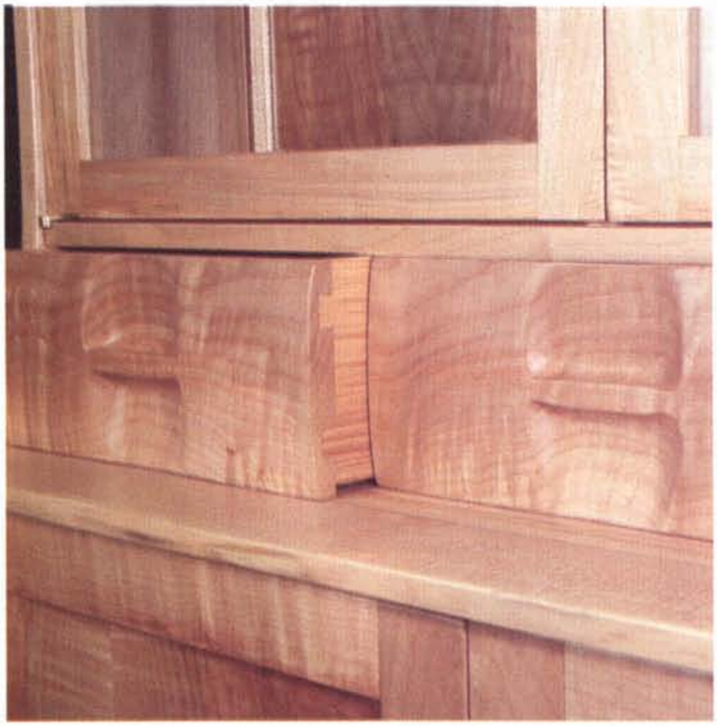
As with the back panel assemblies, the first step here is to make the door panels to the rough size of 5⁄16" X 16" X 23". I said at the beginning that if you can make book–matched panels, they are very effective. One way to do this is to find a board 2" X 8" X 23" with a grain that will make a striking pattern when book matched. Joint one face flat, then joint the two edges square with it. Band saw two 5⁄16" pieces from the 8" face. The mating faces of those two pieces are your book–match. Joint the face of the remaining piece smooth and cut two more 5⁄16" pieces. Again the mating faces are your book–match. Edge glue the pieces and you have the two necessary panels.

The door frames are made from 3⁄4" X 2" stock except for the inner stiles which are 1" X 2" stock. Again, the joints are open end mortises. The length of the stiles is the height of the opening less the thickness of the head of the T–nut that you're using as part of the lower hinge. The length of the rails is one–half the distance between the sides. Cut these pieces and mark the inner face and inner edge of each. Set up your table saw with a 1⁄4" wide dado head cutter and set it for a 1⁄4" deep cut. Set the rip fence with the auxiliary fence attached to cut the groove in the exact center of the 3⁄4" rails and stiles. With the inner face against the fence and the inner edge down on the table, cut the groove in all the pieces. Raise the blade 1 3⁄4" high and cut the mortises on the ends of the stiles. Cut the tenons on the rails. Again use a scrap piece of 3⁄4" frame stock to get an accurate setting. Put the frames together and fit them into the case. You can install the T–nuts at this time. Tap them into place using a small wooden block between the nut and the hammer. While you have the frames assembled, it's a good idea to measure the width and length inside the bottoms of the grooves to get the finished size of the panels. They should be 1⁄8" shorter and narrower than the measurements you get.

The next step is to carve the handles on the inner stiles. The detail drawings illustrate this better than I can explain it and the photograph shows what it should look like when it's finished. There are several ways of doing this job. Use carving tools, riffler files and sandpaper as well as careful work. With the handles finished, cut the panels to the proper size. Remember with book–matched panels, if you reduce the width, you must take equal amounts off each edge. If you reduce the length you must be sure the two panels still match vertically. Plane both faces of the panel blanks smooth, and then cut them to size. Cut a 3⁄8" wide rabbet on all four edges so the panels slide easily in the frame grooves. Dry–assemble the frames and panels with the rabbeted faces inside and fit them again to the case. If anything is wrong, correct it now. Apply glue to the joints only, none between the panels and frames, check for square and clamp, if necessary.

When the doors have dried 24 hours, treat the mating edges as you did the upper doors with the rabbet on the right and the glued strip on the left. Use the same dimensions. Install the parts of the hinge system that go on the doors as shown in the detail drawings; the 1⁄8" diameter steel pin in the top edges and the 1/4" id copper tubing in the bottom edge. Round over the outside edges on both doors according to the detail drawing. Use a 3/8" round over bit in your router set in the router table. The doors are installed by slipping the steel pin into the hole in the underside of shelf B, moving the door into place at the bottom, then screwing the doctored machine screw up from the underside of shelf C until it enters the copper tubing. Make sure that the doors swing smoothly without binding and that they close fully and properly. If they don't, make whatever adjustments are necessary. As with the upper doors, to make sure they stay closed, use a 1/4" bullet catch under the right hand door. Set it under the center of the bottom rail about 1" from the mating edge of the inner stile.

The Drawers



The three drawers fit into the pocket in the case as shown, side by side with no dividers between them. To get the width of each, measure the distance between the case sides and divide it by three. The height is also taken from the pocket. As to the depth, this is also taken from the pocket and measured on the drawer from the top front edge of the drawer front to the back and is about 1/16" shorter than the depth of the pocket. This provides the illusion of a frame around them. The fronts are made from 3/4" stock while the sides and backs are 3/8" thick. With the exception of the fronts and the handles, the drawers are quite simple and straight forward to build.

Because the drawer fronts are the most important pieces, you should start with them. You want a 3/4" thick board as wide as the height of the pocket and as long as the width of the pocket plus twice the kerf of your table saw blade. This board should be chosen carefully. You want one with an interesting grain pattern that flows the length of the board—not just a series of straight lines. Choose the outside face and using the detail drawing to make a pattern, draw the shape of the front curve on each end of the board. Use a smooth plane to shape the curve on the front face. Cut two pieces from the board, each the length you've previously determined. Place these pieces end to end at one end of the pocket. Place the remainder of the board against the open end and mark the length with a knife. Be careful to keep the grain lines connected along the three pieces. Mark the three pieces in proper order—1, 2 and 3. Now is the time to carve the handles in the fronts. They can be held in the vise while you carve. The detail drawing and the picture explain them better than words can. Work carefully—if you spoil one, you'll have to do them all again in order to maintain the flow of the grain lines.

After you've cut and fit the joints, cut the drawer bottom grooves in the fronts, sides and backs. The top of the groove is 3/8" from the bottom edge. The groove is 1/4" X 1/4" deep. Remove the bottom part of the backs up to the top of the groove. Dry–assemble the drawers and see that they slide in and out of the case smoothly. If you have been careful in sizing the parts, there shouldn't be any trouble with the fit. You can now apply glue—be sure the drawers are square when you set them aside to dry. While they're drying, make the panels for drawer bottoms. These should be solid wood not plywood or chipboard. Make them with the grain running the width of the drawer. They're 1/4" thick and should fit in the grooves and extend over the bottom edge of the backs. Make them up with as few pieces as possible depending on how wide a board you can resaw. Make them a bit oversize so you can trim to the exact size after the glue dries. Rabbet the sides and the front to fit the drawer bottom grooves. Make it an easy sliding fit. Fasten them in place with a #5 X 5/8" brass wood screws through the bottom into the back.

The Adjustable Shelves

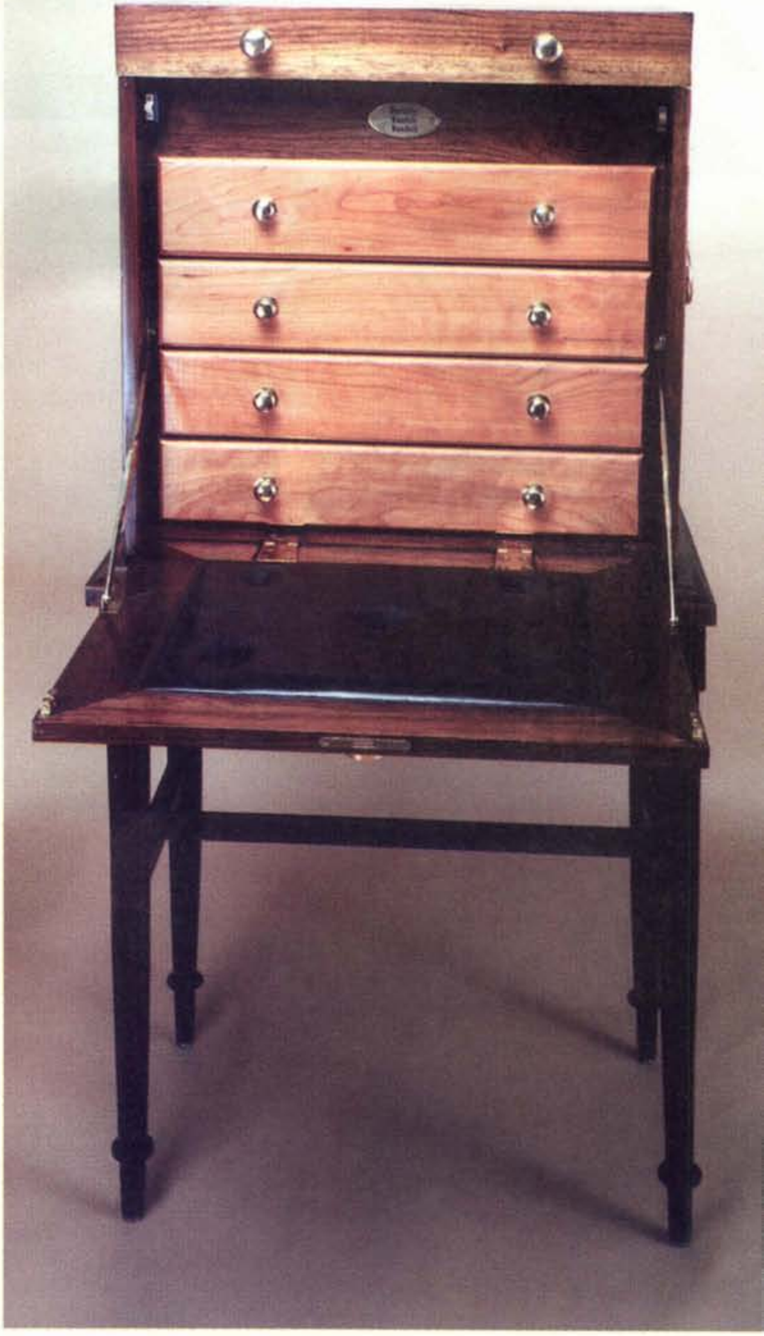
The shelves in the upper section are 5/8" thick and those in the lower section 3/4". The length and width of of the shelves are determined by their location. They are 1/16" shorter and narrower that space available. Each shelf is supported by four wooden shelf supports made according to the drawing. I suggest two or possibly three shelves in the upper section and one or two below depending on the height of the things you want to store.

The Finish

I'll make the same statement I always do at this point, however you finish this piece—don't use any stain. It will only muddy and spoil the grain patterns that you've spent so much time searching for. To make the job easier, remove all the doors, drawers, adjustable shelves, and back panels—finish them separately. Remove the doors out in the reverse order that you put them in. In my work today, I use Formby's low–gloss tung oil finish. Use two or three coats followed by as many coats of paste wax as needed to get the sheen you want. The denser the wood, the fewer coats it'll take. Don't use a liquid or spray–on wax. They don't do the job and the water in them may ruin the tung oil finish you have already applied. PW

A Popular Woodworking Project

A Chest for Silver Flatware



The Shakers have disappeared from the rural American utopian communities they created "with hand to man and heart to God," but their beautiful and simple handcrafts live on.

The Whitney Museum mounted an ambitious exhibit of Shaker handwork in 1986. It was an epiphany for me. The catalog is one of my most cherished reference texts and from it came the inspiration for a design solution to an everyday storage need. We have three generations of sterling silver flatware, dispersed in various "safe" places throughout our home, that tarnish between infrequent use. On special, ceremonial occasions the collection is assembled and feverishly polished by any family member who can be dragooned into the thankless chore.

A local silversmith told me bluntly, when I inquired about the excessive labor associated with polishing the silver for such infrequent use: "Use it, use it regularly, and you'll enjoy it a lot more. It won't need so much polishing and then you can hand it down to the fourth generation, sterling silver flatware that has the elegant patina of use. Live a little."

by Jim Randall

I examined several high priced silverware chests in several quality furniture showrooms and none of them had all the features I wanted. The completed piece is a chest–on–table design. The chest has a lift top with storage space partitioned lengthwise. The drop front interlocks using a mortised lock with matching striker plate recessed into the front edge of the top lid. Additionally, the drop front has a padded leather insert for sorting the dried silverware as it's replaced in its respective drawers. The four drawers are identical and partitioned front–to–back. The Shakers used frame and panel construction extensively, but not with raised panels. This was my first departure from their beautiful, unadorned creations.

The Shakers often used American black walnut as well as black cherry. Both woods were abundant during the flowering of their handcrafts, the late 17th through the mid–to–late 18th century.

The table here is walnut throughout with tapered and fluted legs—another departure from unembellished Shaker simplicity. The table contains a single drawer, partitioned into six equal storage bins. For stability, the legs are tied together with three stretchers. The carcass, drop front and lift top are made from ¾" black walnut. The drawers are made of cherry.

***Jim Randall** see* Turnings, *page 6.*

Frames and Panels

The drop front and carcass sides are frame and panel construction. Cut the carcass side and drop front frame pieces (A–D) to the dimensions given in the Cutting List. Miter the ends of each to 45° as shown in the carcass side evolution Figure A. With a straight cutting bit installed in the router table, rout ¼" X ⅜" deep spline slots in each mitered end of the rails and stiles. With the same router bit, reset the cutting depth and the fence to cut ¼" X ½" deep slots centered on the inside edge of each frame piece to receive the panels.

Glue up walnut stock for the carcass side panels (E) and the drop front panel (F), then cut them to the dimensions given in the Cutting List. Notice that the panels are ⅛" smaller on each side than the routed grooves in the frames which receive them. This allows for expansion and contraction of the floating panels due to changes in humidity.

The outside panel faces have decorative edges routed into them (refer to raised panel figure). Use a bearing equipped raised panel bit, ogee bit or cove bit in the router table to cut the panel tenon/decorative edge. Notice that the inside of the drop front panel is recessed in from the frame. This provides space for the sorting cushion.

Cut the frame splines (G) from oak stock to the dimensions given in the Cutting List. Dry assemble the frame and panel assemblies with the splines in place and check for square. Mark all matching parts and disassemble everything. Finish sand all parts through 220–grit sandpaper. Glue the frames and splines together around the floating panels—do not glue the panels.

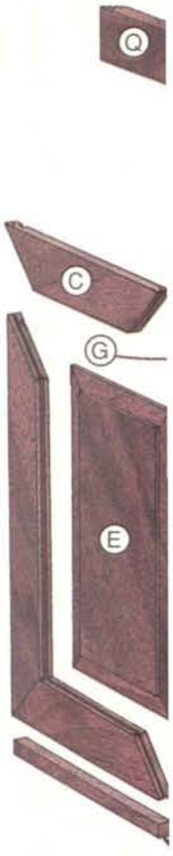
The Carcass

The inside of the carcass side frames are dadoed, tenoned and biscuited to receive the carcass back, bottom, dividers and drawer runner assemblies. The sides are mirror images of each other.

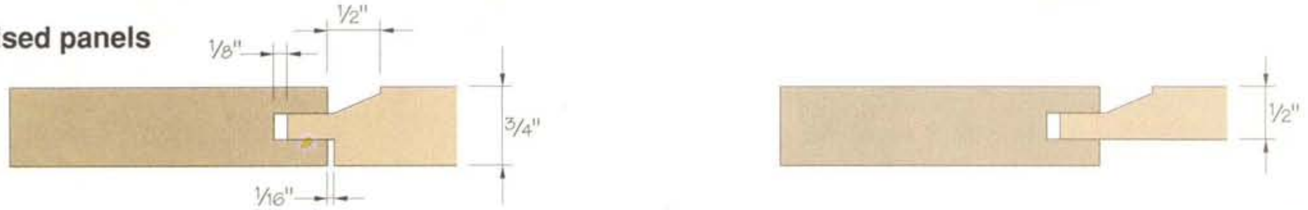
Silver Chest

Cutting List

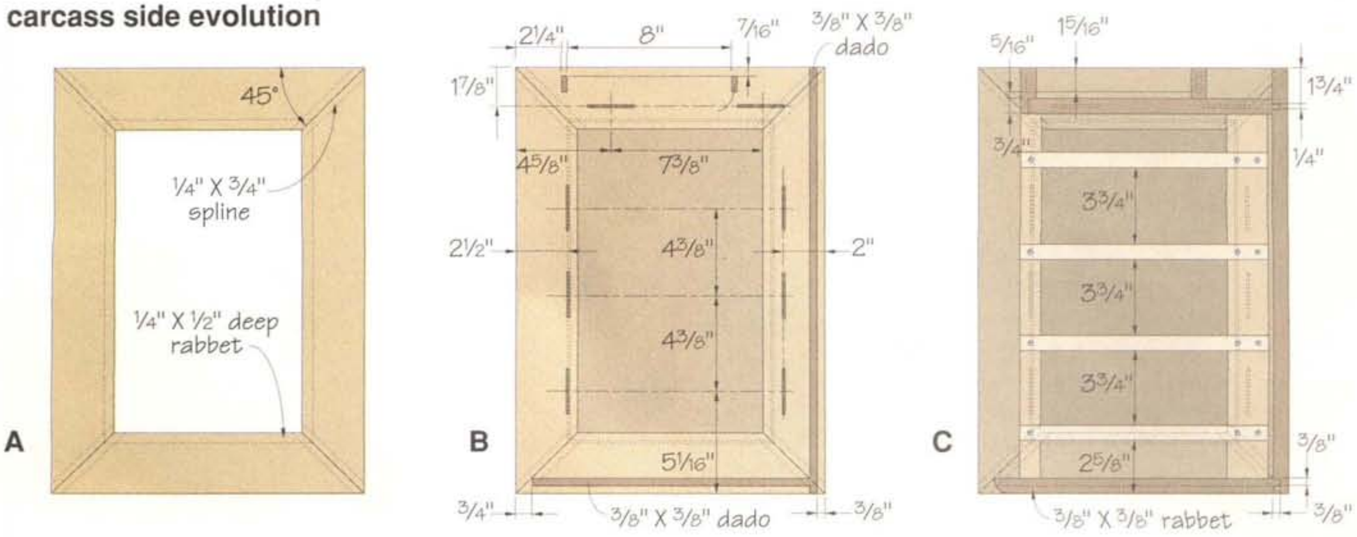
Qty	Part	Finished Size T	W	L	Piece
4	A	¾"	3"	21"	carcass side stiles
2	B	¾"	3"	21"	drop front stiles
4	C	¾"	3"	15"	carcass side rails
2	D	¾"	3"	22½"	drop front rails
2	E	¾"	9¾"	15¾"	carcass side panels
1	F	½"	15¾"	17¼"	drop front panel
12	G	¼"	¾"	3¾"	frame splines
1	H	¾"	21"	23¼"	carcass back
1	I	¾"	14¼"	23¼"	carcass bottom
1	J	¾"	2¼"	23¼"	front top divider
1	K	¾"	1½"	23¼"	rear top divider
1	L	¾"	12¼"	22½"	top shelf
2	M	¾"	1"	18"	front runner supports
2	N	¾"	2"	18"	rear runner supports
8	O	⅜"	¾"	12"	drawer runners
2	P	¾"	3"	24"	lift top sides
2	Q	¾"	3"	15"	lift top ends
1	R	¾"	14¼"	23¼"	lift top lid
4	S	¼"	½"	3"	lift top splines
4	T	1¾"	1¾"	32"	leg blanks

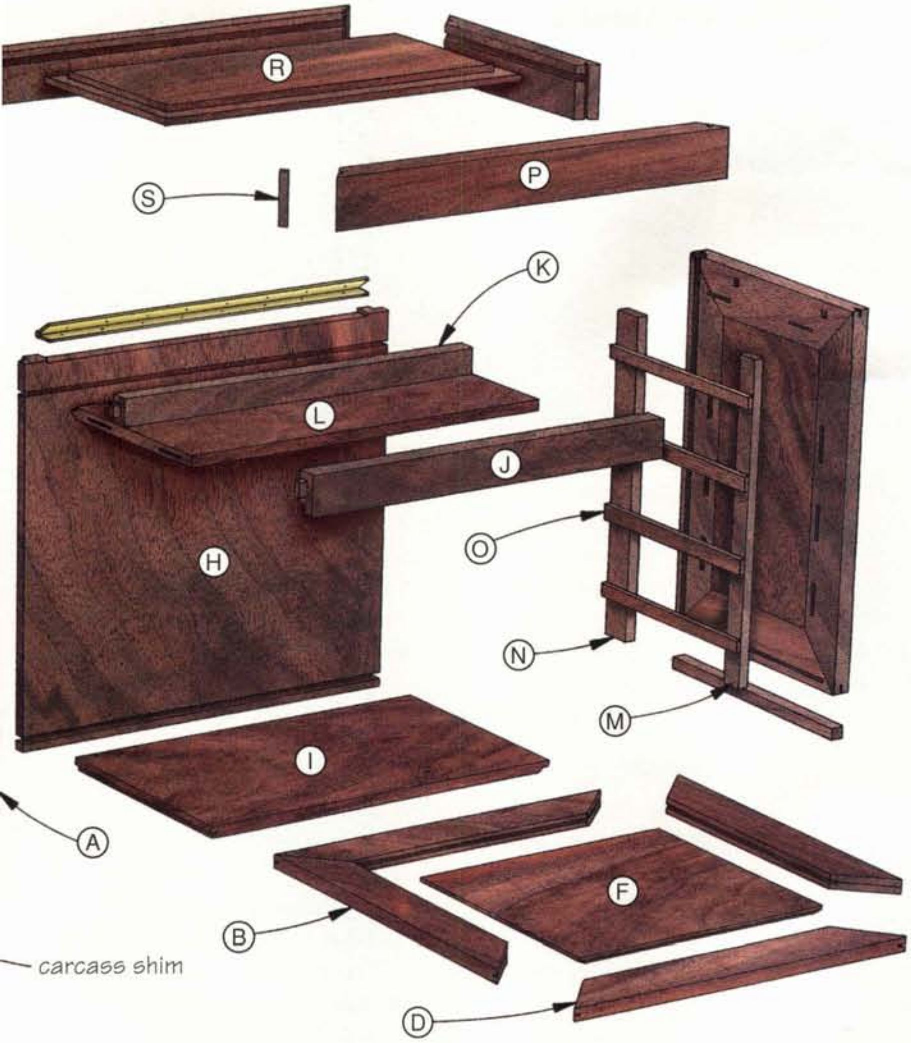


raised panels



carcass side evolution





Silver Chest Cont.					
		Finished Size			
Qty	Part	T	W	L	Piece
2	U	¾"	¾"	17⅜"	side stretchers
1	V	¾"	¾"	27⅛"	center stretcher
2	W	¾"	3"	15½"	side skirts
1	X	¾"	3"	24½"	rear skirt
2	Y	⅜"	¾"	15¾"	table drawer runners
2	Z	¾"	3"	18"	tabletop side frames
2	AA	¾"	3"	27"	tabletop end frames
1	BB	¾"	12¾"	21¾"	tabletop panel
4	CC	¼"	¾"	3¾"	tabletop splines
2	DD	¾"	1½"	27"	side moulding strips
2	EE	¾"	1½"	18"	end moulding strips
4	FF	¾"	4½"	21¾"	carcass drawer faces
8	GG	¾"	3¾"	21"	carcass drawer sides
8	HH	¾"	3¾"	12¼"	carcass drawer ends
1	II	¾"	3"	23½"	table drawer face
2	JJ	¾"	3"	23½"	table drawer sides
2	KK	¾"	3"	15¾"	table drawer ends
4	LL	¼"	11¼"	20"	carc. drawer bottoms
1	MM	¼"	14¾"	22½"	table drawer bottom
16	NN	¼"	½"	3¾"	carc. drawer splines
4	OO	¼"	½"	3"	table drawer splines

Start by cutting the ⅜" X ⅜" deep dadoes which receive the back and bottom as located in the carcass side evolution Figure B. Notice that the dado which receives the bottom is stopped. These dadoes can be cut on the table saw or the router table. Chisel out the ¼" X ¾" X ⅜" deep mortises which receive the top dividers as located in the Figure. To cut the biscuit mortises first clamp the carcass sides flat on your bench with the inside faces up. Mark the eight biscuit locations on each frame as located in the figure. Clamp a wood fence to the frame to align the biscuit joiner. Set the biscuit joiner to the #0 setting and cut the biscuit mortises.

Glue up and cut the carcass back (H) to the dimensions given in the Cutting List. Cut a ⅜" X ⅜" deep rabbet along the outside edge of each side to receive the carcass sides. Cut a ⅜" X ⅜" deep dado on the inside to receive the carcass bottom as located in the carcass side evolution Figure C. Cut a ¼" X ⅜" deep dado on the inside to receive the top shelf tenon as located in the figure.

Glue up and cut the carcass bottom (I) to the dimensions given in the Cutting List. Cut a ⅜" X ⅜" deep rabbet along the bottom edge of each side and the back to receive the carcass back and sides. Round over the bottom of the front edge with a ¾" radius roundover bit as shown in the carcass side evolution Figure C. This rounded edge mates with a coved edge on the drop top when it's opened.

Cut the front top divider (J) and the rear top divider (K) to the dimensions given in the Cutting List. Use a tenoning jig on the table saw to cut the ¼" X ¾" X ⅜" long tenons at each end of the dividers as located in the carcass side evolution Figure C. Cut a ¾" X ⅜" deep rabbet along the lower inside edge of the front top divider as shown in the figure.

Cut the top shelf (L) to the dimensions given in the Cutting List. Cut ⅜" X ¼" deep rabbets along the top and bottom back edges to produce a ¼" X ⅜" long tenon to fit into the carcass back. Cut biscuit mortises centered on each side edge of the top shelf so they align with those cut in the carcass sides.

Cut the front and rear runner supports (M and N) to the dimensions given in the Cutting List. Cut biscuit mortises centered on the outside face of each so they align with those cut in the carcass sides.

Dry assemble the carcass sides, back, shelf and dividers and check for a proper fit. Put the runner supports in place and mark their exact location. Disassemble the carcass and glue the runner supports with biscuits in place on the carcass sides. Cut the drawer runners (O) to the dimensions given in the

Carcass pieces ready for assembly.

Cutting List. After the glue has set, countersink and screw the drawer runners to the runner supports with #8 X 1" FH woodscrews as located in the carcass side evolution Figure C.

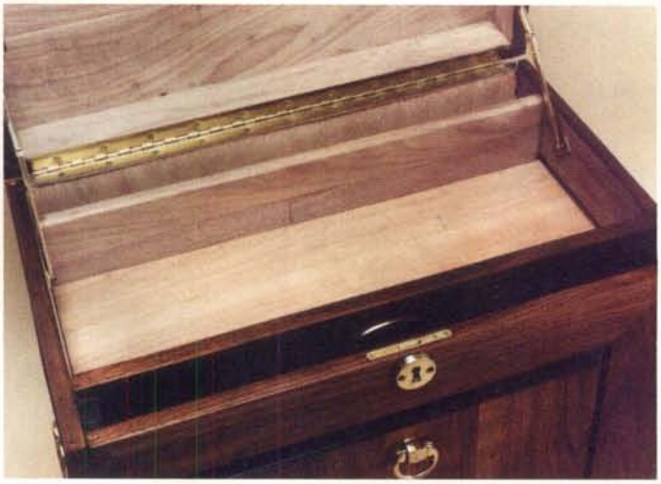
The carcass side assemblies are now complete so the entire carcass may now be assembled. Glue and clamp the carcass back, carcass bottom, dividers and top shelf (with #0 biscuits) in place between the carcass sides. Make a final check for square and set aside to dry.

Lift Top and Drop Front

Cut the lift top sides (P) and ends (Q) to the dimensions given in the Cutting List. Miter the ends of each to 45° as shown in the front view figure. Cut ¼" X ¼" deep spline grooves centered along each mitered end. Cut ⅜" X ⅜" deep rabbets along the inside top edge of each end and side piece. Cut the lift top lid (R) to the dimensions given in the Cutting List. Cut ⅜" X ⅜" deep rabbets along each lower edge of the lift top lid so that it sits flush between the sides and ends. Cut the lift top splines (S) from oak stock to the dimensions given in the Cutting List. Dry assemble the lift top with the splines in place and check the fit. Glue and clamp the lift top assembly.

The lift top is attached to the carcass with a 1½" (open width) X 22½" piano hinge (Garrett Wade–Classic Hardware, 800-221-2942) mortised into the carcass back and lift top back side. The hinge is cut to final length with a hack saw and the rough edges filed. When closed, the lift top should sit flush and square on the carcass. When this action is acceptable, lay out and attach the 12" chest stays (Garret Wade–Classic Hardware). The stays should be positioned so that when fully extended the lift top is perpendicular to the carcass top and the line of each stay is at 45° with respect to the ground plane (refer to the side view figure). When the stays are positioned properly screw them to the carcass sides and lift top lid respectively.

The drop front is attached to the carcass with 1½" X 4½" counter–top hinges (Garret Wade–Classic Hardware) mortised into the drop front and the carcass bottom. Cut the inside lower edge of the drop front assembly with a ¾" radius cove bit to accept the roundover in the carcass bottom. Lay out the hinges so that when closed the drop front is flush with the front edges of the carcass sides and the lower front edge of the lift top. Use chisels and files to cut the mortises so that the hinges sit flush in the drop front and carcass bottom. When this action is acceptable, lay out and attach the 12" chest stays (Garret Wade–Classic Hardware) as was done for the lift top. Look at the side view figure for orientation.



Detail of finished lift top compartment.

Once the drop front and lift top are fit into the carcass and the hardware works precisely, mark the location for the chest lock (Garret Wade–Classic Hardware). Mortise the drop front and lift top to accept the lock mechanism according to the manufacturers specifications.

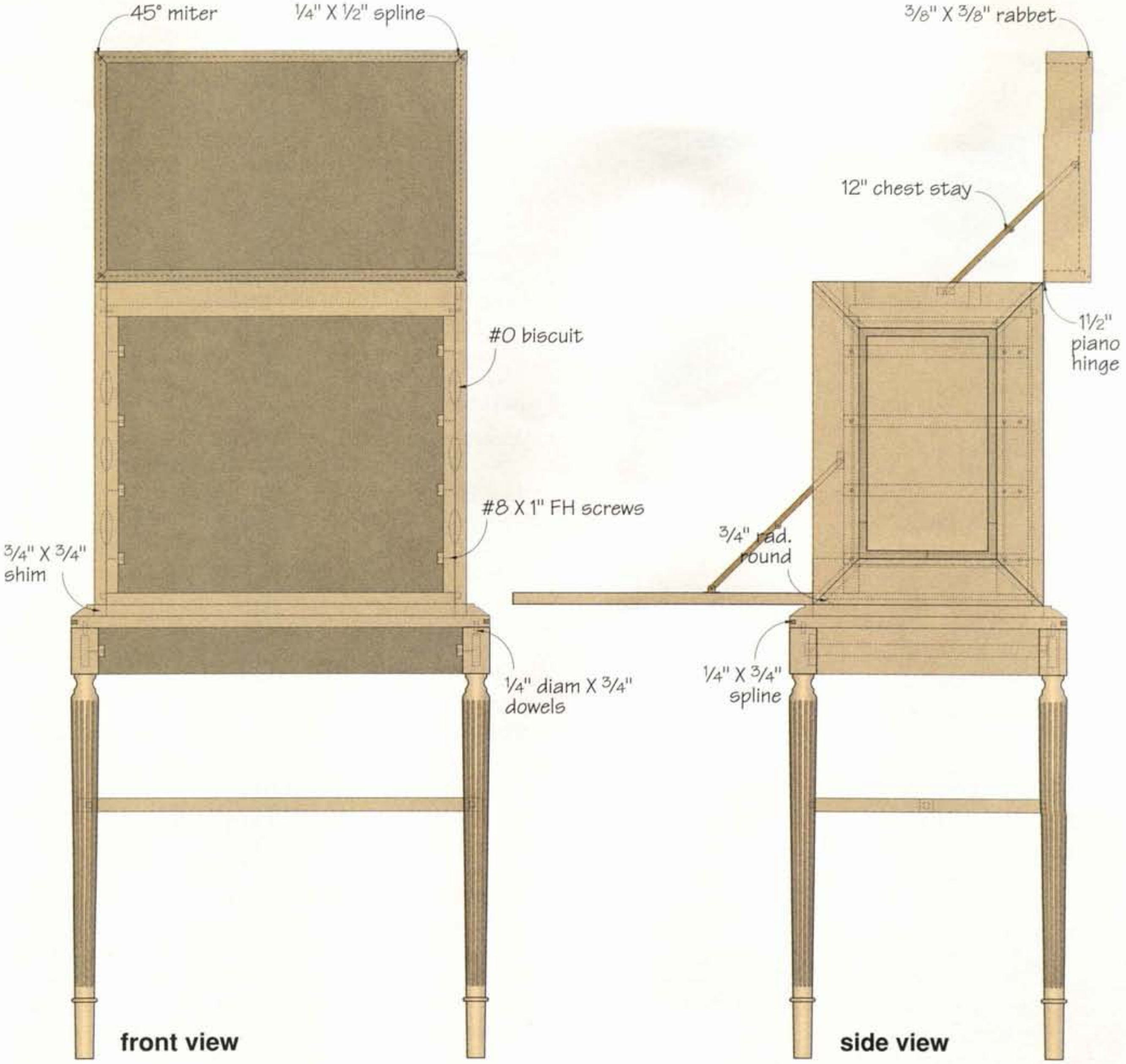
The Table

The table which holds the chest has four identical legs which are turned, tapered and fluted. The top is a frame and floating panel with splined, mitered corners. The framed tabletop is finished with a molding strip mitered at the corners to fit the chest when it's in position. The tabletop is located on the undercarriage with dowel pins. The skirts and stretchers are joined to the legs with mortises and tenons. The drawer runners are constructed in a similar way as those in the carcass.

Cut the leg blanks (T) to the dimensions given in the Cutting List (note that the blanks are 4" longer than the final leg lengths for turning). Before turning, cut the ½" X 2" X ½" deep skirt mortises (one on each front leg and two on each rear leg) and bore the ⅜" diameter X ⅜" deep stretcher mortises as located in the PullOut™ Plans. Turn each leg to mach the profile of the pattern. To add the decorative fluting, construct a jig over the piece on the lathe. The jig should permit a plunge router to run longitudinally over the blank and parallel to the leg taper to allow for cutting depth adjustment.

Cut the side stretcher blanks (U) and the center stretcher blank (V) to the dimensions given in the Cutting List (note that each stretcher is cut 2" over final length to allow for tenon turning). Turn ⅜" diameter X ⅜" long tenons centered on each end of the stretchers. File the cheeks of the tenons on the side stretchers to meet the taper of the legs. Drill ⅜" diameter X ⅜" deep mortises centered on the inside face of each side stretcher to accept the center stretcher tenons (refer to the side view figure).

Cut the side skirts (W) and the rear skirt (X) to the dimensions given in the Cutting List. With a tenoning jig on the table saw, cut ½" X 2" X ½" long tenons centered on each of the skirts. Sand all completed table parts through 220–grit sandpaper. Dry assemble the side stretchers and side skirts between their respective legs to produce two mirror image



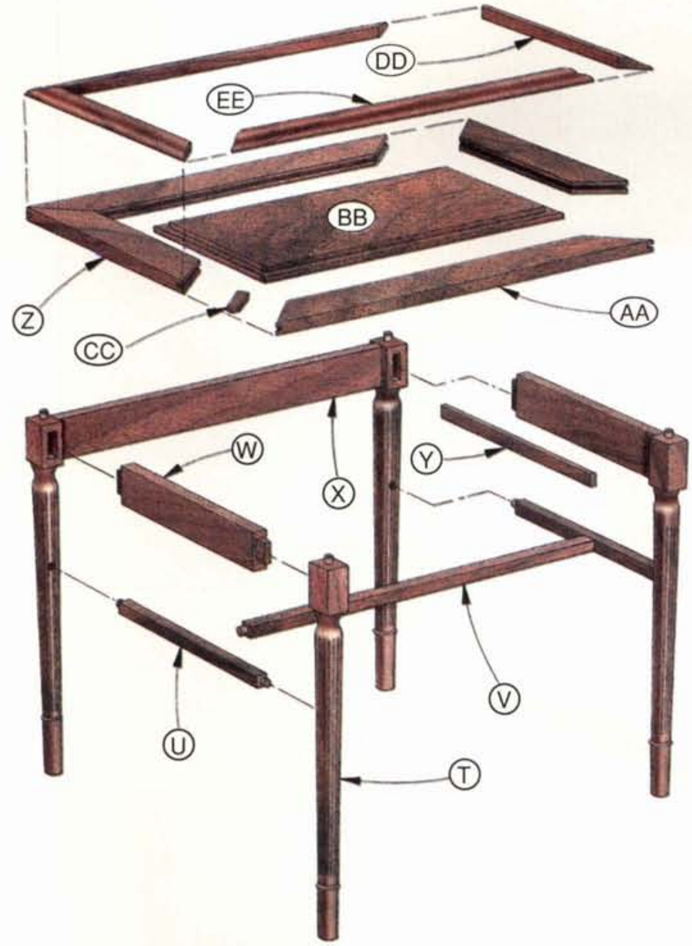
assemblies. If the fit is acceptable, glue and clamp each table side assembly and set them aside to dry.

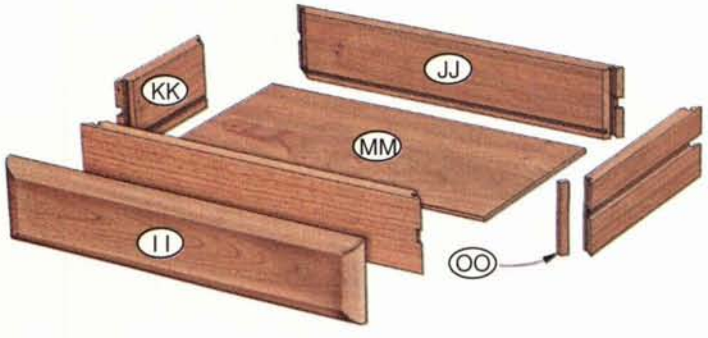
Cut the table drawer runners (Y) to the dimensions given in the Cutting List. Screw and countersink them in place to the inside of the legs with #8 X 1" FH wood screws as shown in the front and side view drawings. Glue and clamp the two table side assemblies together with the center stretcher and rear skirt in place. This completes the table sub–assembly.

Cut the tabletop side (Z) and end (AA) frames to the dimensions given in the Cutting List. Miter the ends of each to 45° as was done for the carcass side frames. Route ¼" X ⅜" deep spline slots in each mitered frame end. With the same router bit, reset the cutting depth and the fence to cut ¼" X ½" deep slots centered on the inside edge of each frame piece to receive the panel.

Glue up the tabletop panel (BB) then cut it to the dimensions given in the Cutting List. Cut a ½" X ¼" deep rabbet along all the edges, both top and bottom, to make a tenon which fits into the frame dadoes. Cut the tabletop frame splines (CC) from oak stock to the dimensions given in the Cutting List. Dry assemble the tabletop frame and panel with the splines in place. Finish sand all parts through 220–grit sandpaper. Glue the frames and splines together around the floating panel.

Cut the side (DD) and end (EE) moulding strips to the dimensions given in the Cutting List. Cut the moulding profile in the top outside edge of each on the router table set with an ogee bit. Miter the ends of each to 45°. Before the table's trim molding is fastened in place, set the cabinet carcass on the table, squared up and set equidistant from all four table edges. Scribe lines around the carcass onto the tabletop. The mitered molding is glued and clamped together to the table. Cut two ¾" X ¾" X 15" shims to be placed between the carcass and the table so that the drop front clears the moulding.





Drawers

Cut the cherry drawer pieces (FF–HH) and the walnut table drawer pieces (II–KK) to the dimensions given in the *Cutting* List. The bottoms are made of ¼" inch solid cherry as are all the dividers. Miter the ends of all drawer sides and ends to 45° as shown in the drawer figure. Cut ¼" X ¼" deep spline grooves centered along each mitered end. Cut ¼" X ¼" deep dadoes ¼" from the bottom of each drawer side and end as shown in the drawer figure. Cut ¼" X ¼" deep dadoes in the inside faces of the drawer sides and ends to accept drawer dividers. The location and number of dividers should be decided on by your personal needs.

Glue up and cut the drawer bottoms (LL and MM) to the dimensions given in the Cutting List. Cut the carcass drawer splines (NN) and the table drawer splines (OO) to the dimensions given in the Cutting List. Dry assemble the drawers. When all fits are acceptable, glue up the drawers with splines in place, letting the bottoms float. Cut ¾" X ¼" deep dadoes in the outside faces of the drawer ends 1⅞" from the bottom of the carcass drawers and 1⅛" from the bottom of the table drawer to accept the drawer runners. With a ¾" radius roundover bit in the router table, round each edge of each drawer face. Screw the drawer faces to the drawers from the inside with #8 X 1¼" FH wood screws as shown in the drawer figure. Slide the drawers in place and check that everything fits snugly and that the drawer faces line up. Finish sand the drawers through 220–grit sandpaper.

Finishing

On every project that I've designed and built over many decades, the finishing process is the most satisfying; when the beauty of the wood comes forth as a simple benediction, telling you that all the work, travail, mistakes and do–overs were worth it. It's as if the finished project has come alive for you, responding to your gentle caresses, which is what the final finishing steps are.

I used standard MinWax™ Walnut Oil Stain and Satin Finish Polyurethane, five coats, sanded between each coat. After 24 hours dry time, apply a final polish with 4X pumice on a soft pad dipped in clean 10/30 motor oil.

Attach the drawer pulls and other hardware of your choice. To make the sorting pad insert for the drop front, first cut a ¼" piece of plywood which fits into the recess. Cut a piece of 1" foam pad to the same size and a piece of leather oversized by 2" in each direction. Stretch the leather over the foam and tack or staple it to the back of the plywood. Upholstery buttons may be attached at intervals and tied down through holes in the plywood. The sorting pad should have a snug, friction fit.

Three generations of sterling silver flatware grace our table regularly, reminding us always of those occasions some of our beloved departed showed us "how to carve" and when "to keep your elbows off the table" and not to talk "with your mouth full."

We know that those who left us some of their small worldly treasures, left us so much more—the gift of beauty and grace and gentility. We know that they are in a safe and lovely place. We pray that they know that some of the symbols of what they meant to us are also, now, in a "safe and lovely place." PW

News and Notes

Products of Interest for Woodworkers

New products to announce? Send a press release and color photograph to the Editor, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207, and we'll consider them for "News and Notes."

Bailey® Professional bench planes are among the broad selection of planes, spokeshaves and cabinet scrappers in the Fine Woodworking and Specialty Tools line introduced by Stanley Tools earlier this year.

Bailey® Professional bench planes feature precision cast iron bases. The adjustments for plane iron alignment, depth of cut and mouth size are simple and accurate. Irons of high–chrome carbon steel are quickly honed to a long lasting edge.

Among the bench planes are smoothing planes, jointer planes, jack planes, fore planes and corrugated base planes. There are 14 different models/sizes with single and double replacement irons available. For general and specialty woodworking there are block planes, bull nose planes, bench rabbet planes, duplex rabbet planes, side rabbet planes, plough and combination planes, cabinet makers planes, spokeshaves and router planes. For a catalog write to: Advertising Services, Stanley Tools, 600 Myrtle Street, New Britain, CT 06050, or see your local handtool retailer.

Hollywood has come to a hardware store near you. Cooper Tools introduces its new line, *Home Improvement Tools and Hardware*, inspired by the TV series. The line is designed and priced for the do–it–yourselfer. A variety of prepackaged tool kits and individual tools with the *H.I.* logo are now available.

The Swanson Mitering Tool and Framing Clamp Set now comes in a plastic carrying case with a handle for ease and carrying convenience. Packaged in each case are heavy duty clamps which hold frames steady in order to glue, staple or nail all the corners at one time when assembling framing, screening or trimming. A miter saw guide, which cuts 45° mitres in workpieces up to 3" wide, is included.

The suggested list price of the kit is $49.95. All items are available individually and are made in the U.S.A. For more information contact Swanson Tool Company, Inc., 1010 Lambrecht Road, Frankfort, IL 60423, or call 815-469-9453.

Direct Safety Company announces anti–vibration gloves and glove liners. They are designed to protect from the vibration and shock produced by power and hand tools, especially in the construction and tree cutting fields. The gloves are said to protect against carpal tunnel syndrome.

They are available in a full range of sizes and come full fingered, fingerless, leather or Nitrile. For a free catalog, write to Direct Safety Company, 7815 S. 46th St., Phoenix, AZ 85044, or call toll free 800-528-7405.

Grizzly's 1994 catalog offers more than just Grizzly products. It also contains accessories like router bits, saw blades, vises, clamps and glue. There's even a section for woodworking books. It's quite a wish list with every tool you'd ever need to build a project, be it a birdhouse or your house. To get your free catalog call Grizzly at 800-523-4777 on the East Coast and 800-541-5537 west of the Mississippi.

We Tried It…

Oscillating Spindle Sander

Manufacturer: Sears/Craftsman. See nearest Sears store.

Description: Cylindrical sander with vertical movement.

Price: $150.

Pros: Removes the waste fast.

Cons: None.

Sears has a winner with this tool. Its ½ horse power motor rotates the sander at 1725 rpm and moves it up and down 60 times a minute. All this while remaining near noiseless; proof that the direct drive transmission performs as advertised. What's that mean when edge sanding a piece of rock maple? It blazes through the work like it was pine. Stock slides smoothly on the 20" X 20" melamine table and a fence is easily accommodated because there's room underneath for clamps.

So is there any reason not to buy one if in need of a spindle sander? Not really. It comes pre–assembled with a 2" drum sander installed. A ½" sleeve is also packaged in the deal, along with a wrench and four different diameter sizes of spacer rings. The plastic base makes for a light weight tool that can be moved around the bench top with ease. There's an attachable tray to store the spacers, wrench and any additional sanding spindles you may want to purchase separately. There's also a dust collection port for a shop vacuum.

Surgi–Sharp

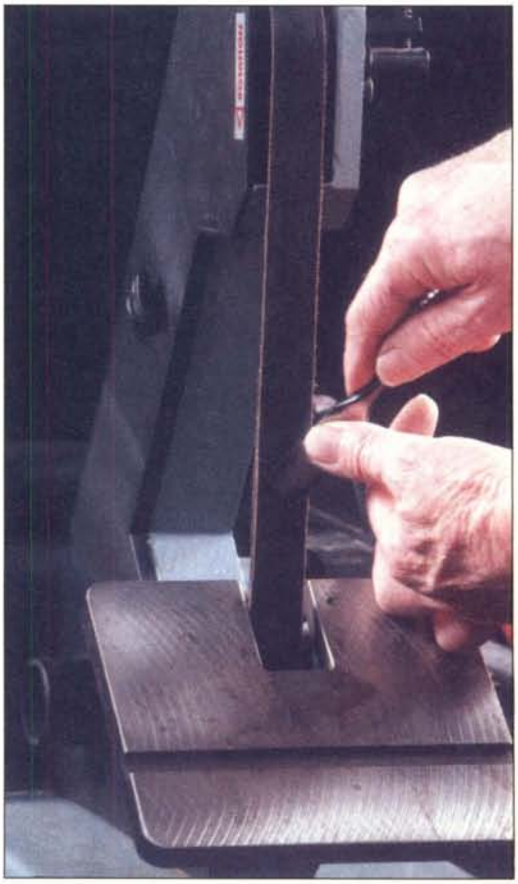
Manufacturer: Wheatland Products 405-745-4656.

Description: Puts a razor sharp edge on most cutter blades.

Price: $10–$20.

Pros: works great, easy to install.

Cons: none.



The Surgi–Sharp leather strop puts a razor sharp edge on knives, chisels, planer blades and just about anything that needs sharpening. It's very basic; rubbing compound on a leather belt spun at high RPM's hones a blade. Get the angle of the blade right and you'll have a razor sharp edge.

Kits are available for a 1" belt sander—shown and tested here. There's also a kit available for a drill—same concept, different method. We have a 1" belt sander in our shop and it's frequently used for fine shaping work. After getting the Surgi–Sharp kit, It hasn't been used for anything but honing chisels and other cutter blades. The change between sanding belts and leather strop is only as hard as removing the safety apparatus.

So how well does it work? Well, it does what it's supposed to do, and quickly. It puts a fine edge on a blade that has been sharpened on a stone, *assuming* the proper edge has been put on the blade. It worked great to take burrs off a chisel and planer blade. It won't help if an improper angle has been ground on the edge of the tool, nor will it sharpen a dull blade, unless you get the optional kit with the three sandpaper grits.

A variety of kits are available. If you have a 1" X 30" belt sander I suggest you get kit #SS6 which includes a belt and abrasive stick for $10.95. (Also available is a 1" X 42" strop.) A complete sharpening kit for the drill includes a rubber drum, three sandpaper grits, a leather sleeve and the abrasive stick. The price is $18.25. For less than $20 you'll be able to keep a fine edge on all your chisels, kitchen knives and your pocket knife.

America's best Spray–On Wood Stain and Sealer

Manufacturer: Alpha–Omega. 800-346-1490.

Description: Oil base spray on stain.

Price: $6.95 for an 8oz. can.

Pros: Gets into hard to reach places.

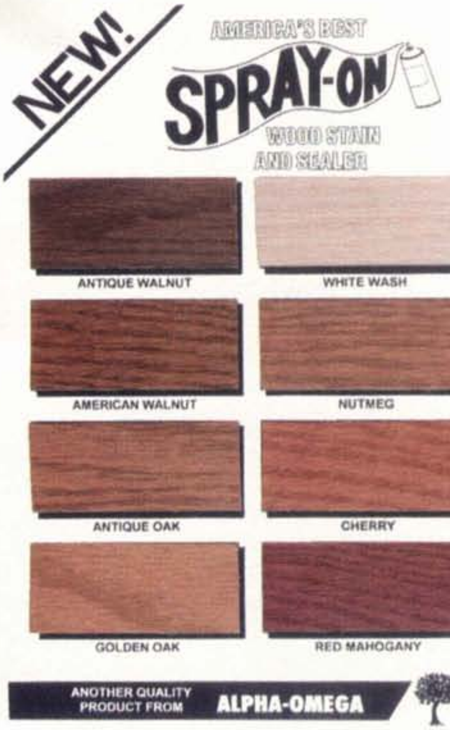
Cons: Not exactly economical.

This stain went on evenly on oak, poplar, kiln–dried pine and sappy construction grade pine. I also used it to stain the inside dividers of a mahogany drop front desk I refinished. It saved time and easily got into the hard to reach corners.

There are a few technical attributes that make this spray on stain unique, but knowing them doesn't make its usefulness any greater. For example; the non–standard spray tip. It doesn't matter the specifics, it matters that it doesn't clog or stop working when the can still holds half its content. I emptied 4 cans without a clog. I used one can half way, let it sit for a week in high heat and went back to it. It worked just fine.

There's also a chemical in the product that is supposed to cut down on overspray. That's relative. I found there was considerable overspray, although less than that of a can of typical spray paint. The product is propelled without harmful CFC's.

There are eight different colors, including a whitewash that would work well on kitchen cabinets. One can covers 35-45 square feet. It sprays on heavy and wipes off easily with no blotching. Let it dry for a couple hours and its ready for a top coat. I tried both a polyurethane and a spray lacquer top coat and both worked well.



Solid Brass Inlay Kit

Manufacturer: The Tool Club, 800-485-6525.

Description: Collar, guide bushing and ⅛" downward spiral router bit for inlays.

Price: $24.95 with bit, $12.95 without.

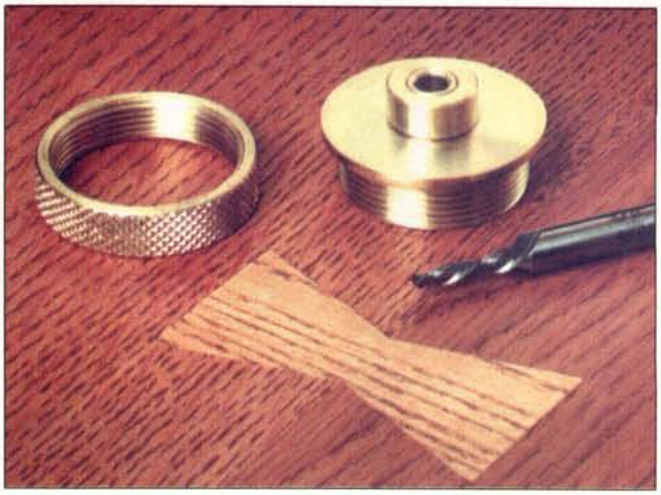
Pros: Easy to set up and use.

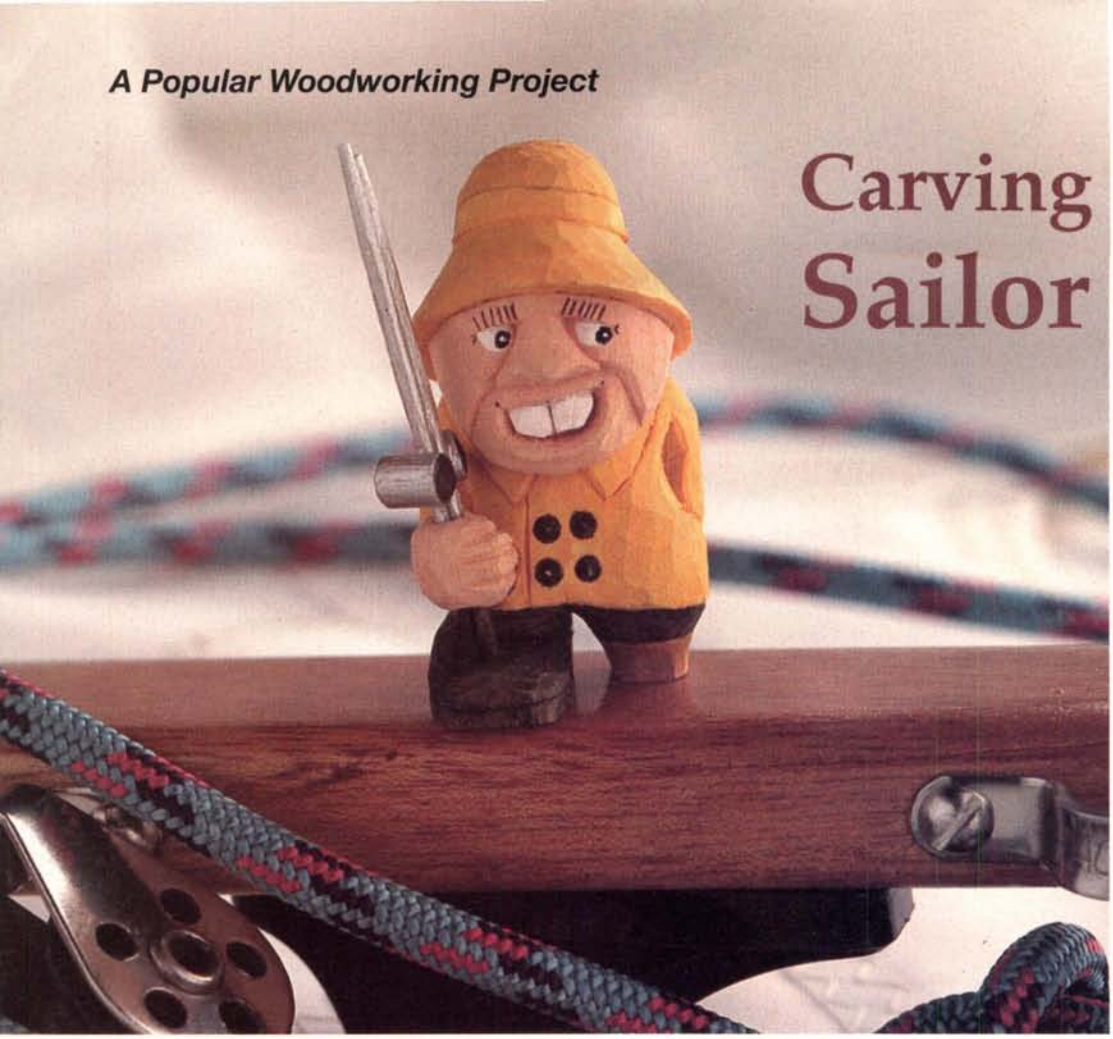
Cons: Requires carful hand work to achieve perfect fit.

Do you like the look inlaid wood adds to a project? The Tool Club has a slick new kit that makes custom inlay work easier. It fits all routers that accept a two piece template guide bushing. Adapters are available for those routers lacking this capability.

How well does it perform? Like many things, that's a conditional question. Overall, the tool is a sound performer. The few exceptions are problematic and relate to complimentary tools. For example, the face plate in our DeWalt plunge router isn't clear. When routing a pattern you must rely on the feel of the bushing against the template. This isn't too bad when cutting simple designs, like an oval. Cutting the female portion of the design is easy despite the fact you can't see what you're doing. The inlay is trickier to blindly cut. During both procedures a clear plexiglass face plate in your router makes for a more confident cut. Other things you'll need; ¼" hardboard and a scroll saw to cut out the patterns. Make your patterns a bit oversized, you'll need at least 9/16" for the bearing. You'll also need a sharp chisel to trim any square edges.

It took about an hour to cut the template, rout the shape and the inlay piece, glue it together and sand it. Pretty good for the first time and like most woodworking processes, the second try was faster and more accurate. When I went to make my initials I cut the template too small, then, when I did get it right, the inlay was too big for the space and had to be sanded—the square and round corner discrepancy was really tedious. Be patient and it works great, hurry and you might as well cut it by hand. One more thing, establish a safe place to store the removable bushing. It's small and easily misplaced.





Carving Sailor Sam

by Keith Randich

Start with a block of wood 2" tall and 1" square. Basswood was used for the carving shown, but any soft, straight–grained wood will do. I've used pine, tupelo, catalpa, butternut, walnut, cedar and others. You'll want a piece of wood soft enough to push a knife through, but still hard enough to hold the detail of the carving.

Sand the bottom of your block so Sailor Sam stands without wobbling. Start about 3/4" from the top and round over the top of the block. Turn the block as you carve to check your progress. It should appear that a ball is growing out of your block.

Stop cut a line to represent the underside of the brim of the sailor's rain hat. The line is 1/2" from the top of the block in front and tapers to 1" down in the back. Continue cutting all the way around until you've reached a depth of 1/8".

To eliminate any chance of Sam having a "boxy" shape in the body and face, the following steps also help put the nose well out in front of the face, the shoulders back and the chest out.

On the front of your block, draw two parallel lines a 1/4" apart from the hat to his toes. On each side of the block,

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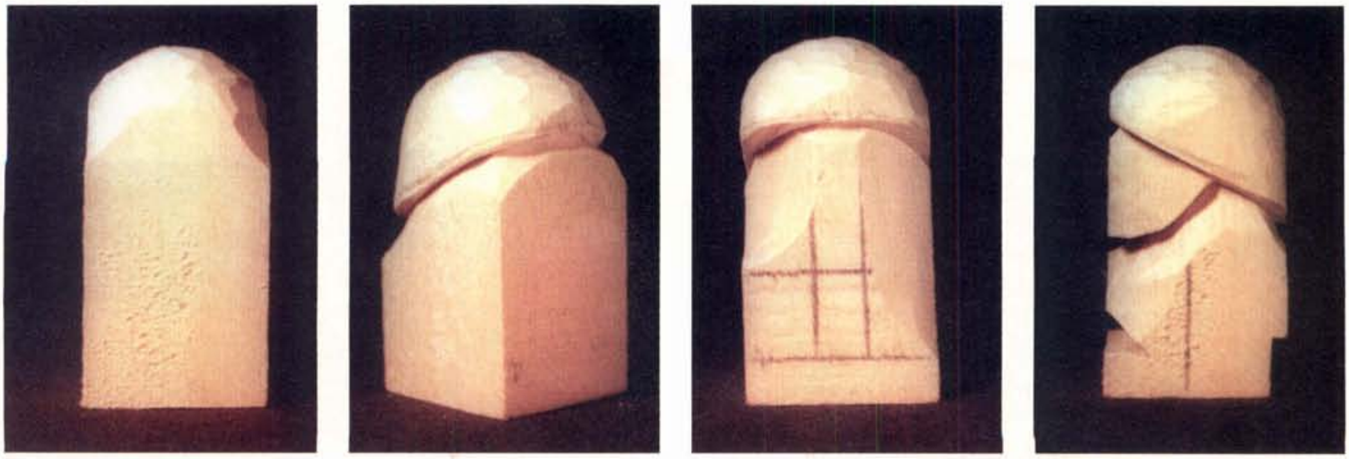
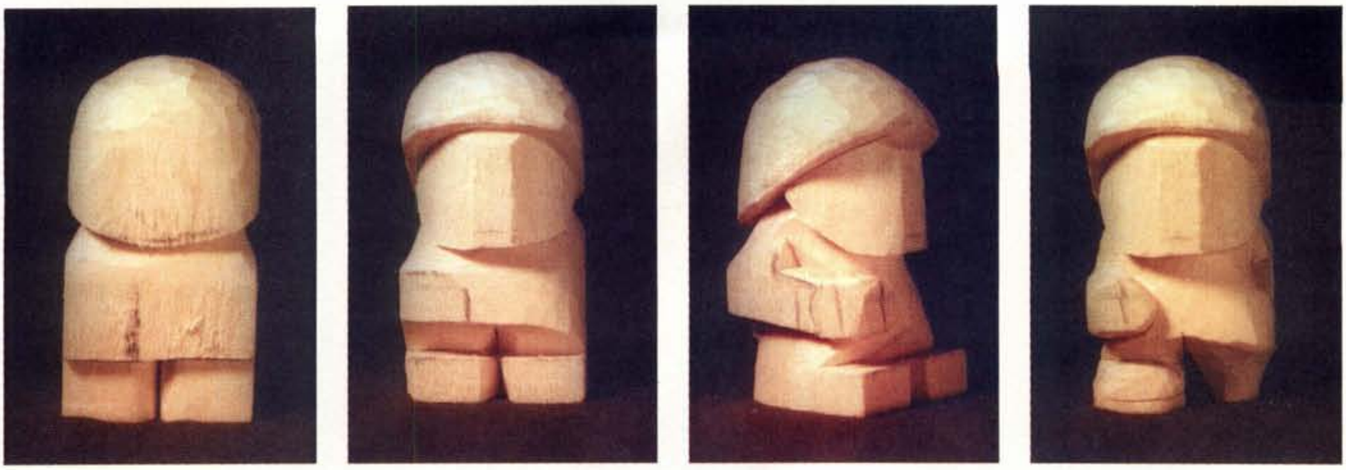
***Keith Randich** is a wood carver in Greece, NY and author of the book, "Carving the Little Guys".*





draw a single line in the middle, also from the hat to toes. Draw a horizontal line on the front of your block about 1/4" from the bottom. This horizontal line represents the tops of the boots. Draw one more horizontal line across the front of your block 3/4" from the bottom. This line is for the top of the extended hand. Decide on which side of your figure the extended arm will reside, and start your slicing cut above the upper line on this side up to the hat. This hand will get in your way during a couple of operations (especially the cleanup step), so work around it carefully. Start the slicing cut on the other side above the boot tops and carry it up to the hat. Be careful as you near it—the hat is quite delicate. Continue slicing away using the vertical lines as your guides. When completed, the front of the figure will be V–shaped.

Next, carve the coat–tail. Push the knife edge straight in about 3/8" from the bottom to make a stop cut, then make a slicing cut up from the bottom of the block to pop out the chip. Repeat these cuts until the coat–tail stands out about 1/8".

To block in Sailor Sam's head, first mark the chin position about 1" down from the top. The jaw line tapers up each side to the hat, meeting it about halfway around the side. Carve the neckline by pushing the knife edge straight in as we did with the hat, then make slicing cuts until you've reach a depth of 1/4" under the chin.

Make a stop cut on the shoe line drawn earlier, then pop out the chip by carving down from the belly at a 45° angle. Start this belly–cut about 1/4" above the shoe tops. Make the stop cut deeper and keep popping out the chip until the cut is at least 1/4" deep.

Spend a few minutes rounding off the figure and cleaning up the cuts made so far. Flatten the belly on the figure. Working around the extended arm, round off the front and sides of his torso. Begin with your blade at the belly and slice right up into the chin and back towards the shoulders. Clean up the stop cuts under the chin and jaw. Gently round over the edges from the back to the base of the hat.

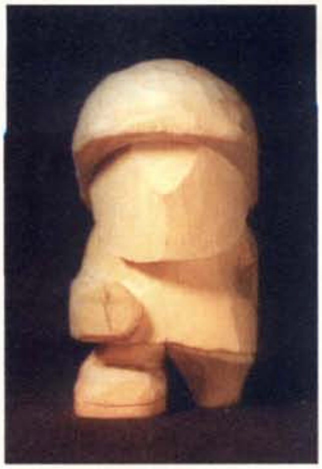
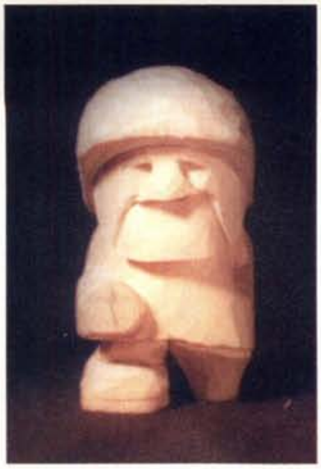
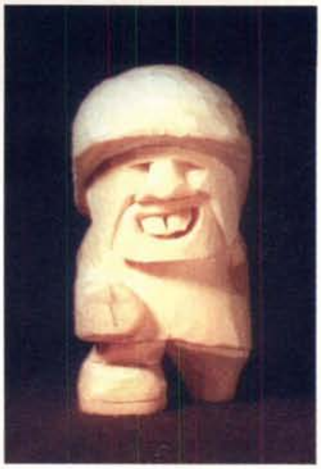
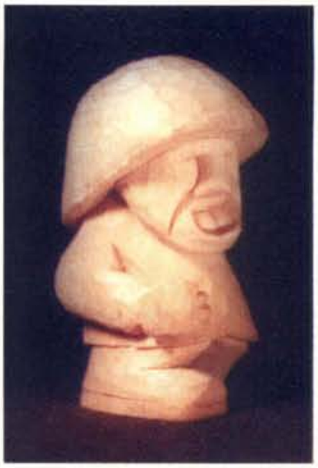
Make a vertical stop cut from the coat–tail down to the bottom of the block for the back of the boots. Use just the tip of the knife blade and round off both sides of the stop cut to further separate the boots. Sight down the underside of the block to make sure they remain balanced.

Next, block out the front of the boots. Draw a line from the inseam to the ankles. Mark the center of the boots as well. Starting between the two boots, make very small stop cuts at a 45° angle toward this center line. The space left by these cuts will form a "V" between the boots. Carefully continue these cuts until the "V" goes back to the ankles. Again, check your progress by viewing the bottom of the block. Carve the front of the legs similarly to the steps used in cutting the rear. Start with a deep stop cut down the inseam line. Use the tip of your blade to round over this cut on both sides as you did on the back of the boots, but this time start the cut at the inseam and slice down to the ankles.

Now for the arms. One arm on this guy will extend forward, while the other angles down and into his pocket. Draw the extended arm as a right angle. At the front of this arm, draw a circle 3/8" tall and 3/8" wide for the hand. Begin drawing the other arm by lining up the backs of the two arms. Draw two vertical lines 1/4" in from the sides on Sailor Sam's back to represent the backs of the arms. Turn the figure on its side and draw a short vertical line for the front of the upper arm. Draw another short line at a 45° angle toward the front for the forearm. Draw a parallel 45° line 1/4" below to form the bottom of the arm. Draw a pocket line perpendicular to the arm at about wrist level.

Use care when carving the extended hand. Make all cross–grain cuts in the direction of the body. Cuts away from the body may break off the hand. Carve the wood away below the elbow until you've reached the line drawn in back. Once the hand is blocked in, drill a 1/8" diameter hole for the fishing rods. Start the hole from the top and proceed slowly. Too much pressure on the drill will tear out the bottom of his hand.

The arm with the hand in the pocket is carved in a slightly different manner. To give the arm the appearance

of reaching in the coat pocket, the cuts are deepest at the elbow, and shallow at the pocket and at the shoulder.

Carve a straight–in stop cut on the lower part of the arm, again keeping the cut shallow at the pocket and deep at the elbow. Beginning at the bottom of the block, slice away the wood below the arm up into this stop cut. Continue these cuts until the widths of both arms appear similar when viewed from the back of the figure. Complete the upper portion of the arm by making a stop cut beginning at the armpit and blending into the elbow and forearm. Make a shallow stop cut in the back from the armpits to the elbow. Round the edges left by these cuts into the back of the coat.

Don't get too carried away when finishing up the boots; bigger is better. With light, delicate cuts, round off the inside and outside front corners. Check your progress by holding the character upside down. Next, round off the tops of the boots. Take very small cuts. It may seem that you aren't accomplishing much, but just keep knocking off the edges. Don't go more than halfway down the side of the boot to carve; stick to the tops.

Now it's time for the optional peg leg. Peg leg carving is an enviable skill to possess. Anytime I mess up a shoe on a sailor—viola—it's peg leg time. If I design one into a character like Sam, I'll carve both legs and boots the best I can, then I'll pick my favorite. The toes of my second–place *finisher* are lopped off back to the ankle. To do this, start at the top of his leg, and slice with an in–and–down motion towards the base. Rotate the figure as you carve until the peg is 1/4" in diameter at the base. Clean up the inside of his good leg and round it over again.

Draw a line around the remaining boot about 1/16" from the bottom for the sole. A shallow stop cut on this line is all that's needed to make the sole stand out from the rest of the boot.

Pencil in the rest of his coat bottom. Start by drawing a horizontal line from the coat–tail, carved earlier, to the front. Make a straight–in stop cut, and carve away the wood below to a depth of 1/8".

Now for the face. Begin by carving the face into a long V–shape. Starting at the jaw line, carefully slice up the sides of the face to the hat.

The next step ensures that the nose becomes the most prominent part of the face. Make a small mark in the center of the face. The tip of the nose will be slightly below this mark. Place your blade on the mark and slice up under the hat to create the bridge of the nose. Continue making this cut until the bridge flows back from its tip and disappears under the hat.

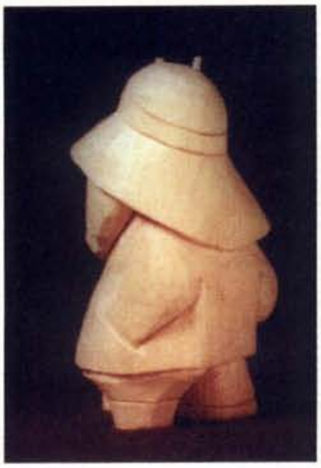
Make a stop cut across the face just slightly below the tip of the nose. Slice out a chip by carving up into the stop cut from below. This cut defines the distance the nose will stick out from the face. Be careful making this cut, as the nose is delicate and will pop off if the knife blade hits it. Don't be afraid to hang a big nose off the front of Sam. You can always pare it down.

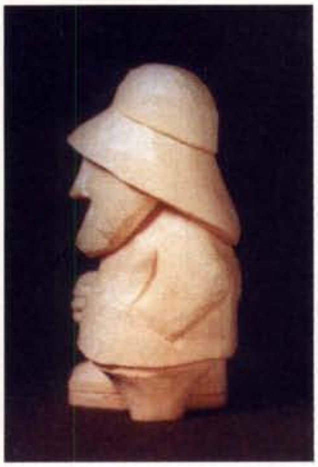
Using just the tip of the blade, carve 1/8" deep stop cuts to define the nose and eye channel. Be sure to hold your blade perpendicular to the block as you make these cuts. Slice away the wood on the outside (cheek side) of the nose. Start at the base of the nose with the tip of your blade and slice right up into the eye channels. The cut starts shallow at the base of the nose and gets deeper as you reach the eye channel. Repeat the cut until each eye channel is about 1/8" deep.

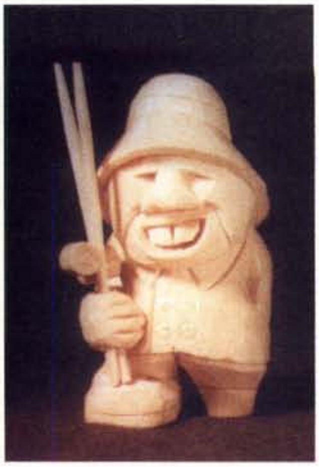
Make a stop cut on the cheek line, then slice away the wood on the inside (mouth side) of it. Again, use just the tip of the blade and slice from the chin up to the nose.

Model the nose. Tiny cuts will do a lot to alter the appearance of the nose. Big cuts, on the other hand, will make it disappear.

Take a minute to experiment with the mouth. Practice different shapes on a piece of paper, then lightly draw your







favorite on the block. I like to carve in a couple of teeth. Don't attempt to pencil in a full complement of molars and bicuspids. Outline the teeth with stop cuts and dig out the wood in between. Gently shave the teeth from tip to root so they'll appear to be inside the character's mouth.

Now we'll give our sailor a lip. Start with a shallow in–and–down slicing cut about $^{1}/_{16}$" below the mouth, which will leave a little mound for the lower lip. When the lip is defined, round the chin and jaw into the neck. Lightly round over the cheek line using the tip of your blade.

Cut a shallow "V" across the wrist to separate the hand from the arm. Blend this cut into the hand and the arm.

Carefully round over the hand and both arms, using just the tip of your blade. Draw three lines on the hand to define the fingers. Make tiny stop cuts on each line. Widen these lines by carefully recutting each stop cut, angling the blade in either direction to round over the fingers.

Make a stop cut for the pocket that the hand is in. Shave away a little of the wrist and arm to make it appear that the arm goes into the pocket.

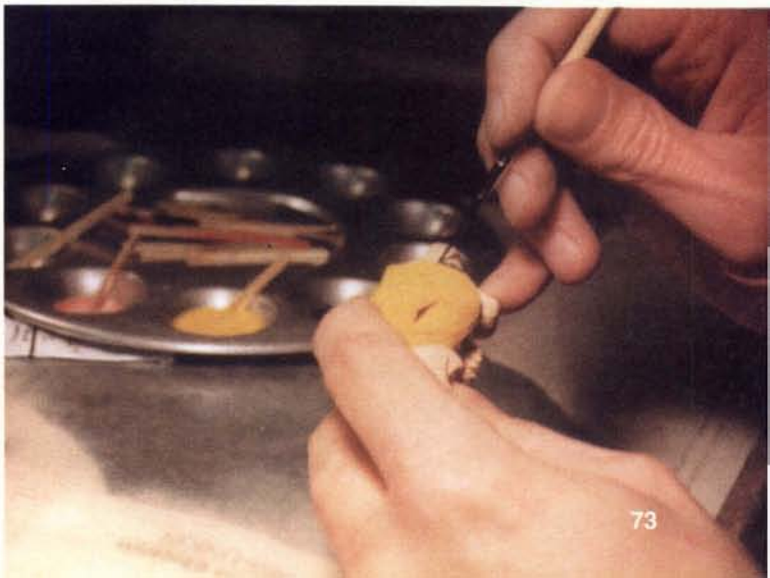
The hat sits on the back of Sam's head, so slice a little of the wood away from the front of the hat. Round over the top again, turning the block as you carve. Draw a brim line about $^{1}/_{4}$" from the top. The brim will be longer in the back than the front. Make a shallow stop cut on the line and finish with small slicing cuts from the edge of the brim up to the stop cut. Reround the crown of the hat one last time.

Before we get down to the final "dressing," spend some time doing a final cleanup. Round over corners and recut the bottoms of your cuts. Look for balance and symmetry in the face, hat, arms and coat. Make sure your blade is sharp and take very light cuts.

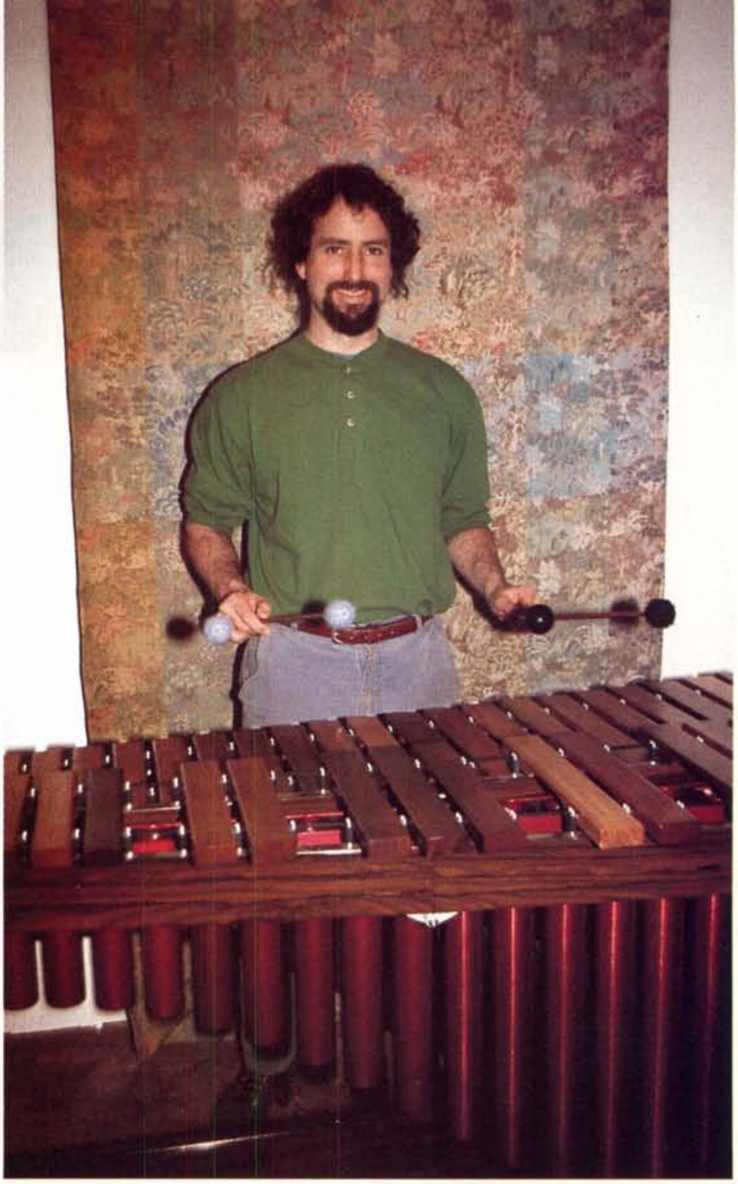
Using a sharp pencil, draw in the details on the raincoat. It will need buttons and lapels. Also, draw a line around the peg leg $^{1}/_{4}$" from the bottom to separate the peg from the leg. Cut these lines with very shallow stop cuts. You may want to switch to a smaller blade for this detail (I use an X–Acto #16). Widen these lines by recutting them with the blade angled slightly.

For the rods and reels, I cut tiny pieces from a $^{1}/_{4}$" dowel and glued them to toothpicks that have been whittled down to slide through the hole drilled in the extended hand. I have shown the extended hand with fishing poles, but you can substitute a multitude of articles for Sam to be holding, such as an anchor, life buoy, net, harpoon, ramrod, saber or flag.

I've had success using both watercolors and acrylics on my little people. Tiny brushes are required for this work (#2 down to #0000). Start with the lightest colors first, move on to the darker ones, then put on a second coat of the whites and yellows. For the eyes, place a circle of white about $^{1}/_{8}$" in diameter in each eye channel. Put in a smaller circle of blue, brown, or green for the pupil. Be sure the eyes look to the side. A final touch is to add a dot of white to the pupil to give our sailor that glean in his eye. Let the paint dry overnight and spray a clear acrylic finish on your tiny masterpiece. PW



Ten years ago, Ron Samuels was enjoying marimba lessons at Humboldt State University in Arcata. Living the lifestyle of a struggling student and musician at that time, he found it impossible to buy any of the marimbas that were available. He decided to build one for himself—through a seat of the pants effort, he succeeded. After the first, Samuels continued to build marimbas, each one better than the last. Desiring to make the finest marimba possible, Ron Samuels and his engineering friend R. Thom Palmer developed a number of unique innovations over the years that have resulted in a well built instrument with an excellent quality of sound.



Perfecting the Percussion Instrument: Marimba One

by Deborah R. Upshaw

One of the most important components of this percussion instrument are the tone bars which musicians strike with various mallets. The bars are made of Honduras rosewood (species: *dalbergia stevensonii*), which comes from Guatemala, Belize and Honduras. "The rosewood has never really become a merchantable timber," says Samuels, "it's been used primarily for marimbas and a little bit for furniture. That's because of its wandering heart and the fact that the inside is almost always rotten. I use the clear, vertical grain wood that is closer to the outside. It rings better than flat sawn rosewood and is much less prone to cracking or splitting."

***Deborah Upshaw** is a freelance writer from Eureka, California.*

The kiln dried rosewood is graded and cut into tone bars from the 8', 10' and 12' stock that Samuels selects from. After being cut to length, the underside is cut away on the bandsaw to a precise contour, then sanded in steps to produce the correct tone.

The rosewood bars (also called keys) graduate in size, getting longer as they step up to the bass end. The shorter bars begin at about 7³⁄₁₆" in length and 1⅝" wide, gradually increasing in size to the longest bar which measures 21¾" and is 3" wide. The bars are 1" thick but can be sanded as thin as ⅛" in the center, after material is removed for tuning.

The thickness of the bar in the center determines what note is produced. Samuels or John Salazar, another trained employee who has an ear for music, slowly remove the material, using a stationary sander equipped with a 6" X 48" belt.

Although the width, length and thickness of each of the rosewood bars are interrelated, it's the finished thickness that's particularly critical. According to Samuels, "the thickness is a function of what the note is actually going to be." The bass bars are the most difficult to tune, requiring accurate tuning of four to five interrelated harmonics.

When tuning the keys, they will stop constantly to strike the bar with a mallet and listen to the sound it projects. Material is removed until the desired note is found; this can get very thin on the bass bars.

"Through experience you can gauge quite well how it will sound. We tune each note using three strobe tuners. It's very accurate. The thinner the wood, the lower the note or frequency. But, each piece of wood is different. Each piece is treated uniquely."

Holes are drilled through the bars with a drill press. This is done so that a silk cord can be threaded through each bar and serve to suspend them above the resonators. The silk cord that Samuels uses on his marimbas is hand made at the shop. "We have our own rope making machine. We take twelve strands of silk thread and spin them into one unit. The silk cord doesn't stretch. It's a strong and natural material."

Small metal jacks guide the silk cord through the bars and also serve to space them evenly. The jacks have rubber bumpers on them so they won't hit the wood. Jigs are set up for installing the jacks into the rails. They are set ⅝" deep and are meticulously aligned. Square shaped pegs on the bottom of the jack make for a tight fit once they are driven into a drilled out hole in the rail.

Samuels can voice the keyboard according to how people want it, "what people usually like, in terms of the ear, is a bright and cutting upper end with an even, balanced middle section, and a dark, rich and powerful bass end."

Marimba One offers instruments with a 4⅓ octave range (down to low A), a 4½ octave range (low E) and a 5 octave range (low C). A ready supply of rosewood bars is neatly stacked in cabinets, "We have thirty complete sets on hand at all times, and we're always making more."

Though Samuels admits there are thousands of other woods he hasn't tried, the few he has experimented with just didn't sound very good. "The rosewood is really perfectly suited for marimbas in terms of how it rings. It has an unusual brilliance in the upper end and an incredible warmth in the lower end. It's amazing, it has just the right characteristics."

While the rosewood bars are essential for producing the lovely, melodic sounds of the marimba, the resonators are of equal importance. They are specially designed to get the biggest sound.

Samuels' earliest marimbas featured bamboo resonators, which he claims "self–destructed over the course of a few years." Today they are made of anodized aluminum. The raw aluminum is cut on site with power saws equipped with non–ferrous metal cutting blades.

"The anodizing process," explains Samuels, "is an electrochemical process where the color is impregnated into the metal to about .001 of an inch. The coating itself is actually tougher than aluminum and it forms a beautiful and protective coating. We have it done by a company in Los Angeles."

Samuels uses oversized oval shaped resonators on the bass end to increase their ability to project, "It's acoustic engineering. For example, if you have a resonator that's oversized, you'll get a bigger sound but the decay will be quicker. It takes more of the bars energy to move the air inside that big a resonator.

Precision tolerances are maintained throughout each instrument, including frame construction.

The tone bars are tuned to the fundamental frequency and overtones with a belt sander.

"We start to use oval resonators on the D below middle C. The oval resonators ,as opposed to a round tube, capture more of the bars vibrating energy. We use smaller resonators on the treble end, the idea is to get a little better ring time out of them. These notes naturally project well anyway."

Each resonator has a hard plastic Delrin™ plug driven inside. Samuels adjusts the plug, moving it up and down to determine where it sounds best. He believes there is a perfect spot for each plug. "The plugs function as an acoustic mirror. You want to bounce the wave back with as little lost energy as possible."

Attending to details explains Samuels' growing reputation for building the finest marimbas on the market today. He's known for making quality musical instruments that are played in concert halls around the world.

Threaded adjustment knobs lift the whole bank of resonators up and down. This allows the resonators to be tuned according to changes in the temperature.

"The most focused energy of the bar is right in the middle where the resonator should be. It's logical to be able to adjust the resonators without moving them side to side—a method used by some marimba builders. This always keeps them on center when adjusting them up and down."

The marimba frame is generally made from cherry or walnut. Because each marimba is custom made, the order can specify a frame height—whatever feels comfortable to the musician who will be playing the instrument.

A variety of power tools are used in frame construction: a table saw, jointer, planer, drill press, band saw, routers, sanders and much more.

All the pieces are face jointed, every surface planed and true. Traditional mortise and tenon joinery is used where the stiles (vertical supports) are attached to the headboard and foot board. The center support is attached to the center stiles with hardware custom made on a CNC milling machine.

"The hardest thing is to make it look simple. Everything comes apart. There's no wing nuts or bolts, everything lifts out," says Samuels.

"For example, rails lift in and out. There's a stainless steel pin that sticks out of the headboard, but instead of it going directly into the rail wood, I insert a little plastic Delrin™ sleeve so the steel doesn't ream out the wood as you move the instrument."

Some of the hardware is manufactured by a company in San Francisco that cuts the material to specifications using an abrasive water jet.

"All the hinges and hardware on our marimbas are stainless steel," says Samuels. "It's a good material because it will never rust or corrode and is extremely tough.

"The unique thing about our hinge system is that you see very little exposed metal. You see mostly wood. We call these kerf hinges. On the center support, we built a catch inside. To undo it you press a wood button and it releases. To assemble it you just snap it into place."

This knock–down design makes it very convenient to move the marimbas from one location to another, which is often the case when musicians travel from show to show—Samuels recalls loading his own in the back of a passenger car! Additionally, his company offers special cases to protect the instrument while in transit .

A lot of plunge routing goes into letting in all the hardware—hinges, latches and pins and center support hardware.

"I set everything up so it all works off a ½" bit, and I don't have to change bits. All my router bases are machined out too. It's not the standard base, it's very precise—6.75" in diameter."

All of Samuels routers and bits can be used interchangeably with his jigs. Depth measurements are very accurate, done using a dial caliper.

The rails are *routed and are ready to receive hardware.*

"Rosewood has an unusual brilliance in the upper end and an incredible warmth in the lower end. It has just the right characteristics."

Jigs and custom machined router bases make quick and accurate cuts.

Raw aluminum tubing is cut to size at the shop for the resonators before being sent out for anodizing.

As for finish work on the frame wood, Samuels and his employees stain the wood in the shop, but the final finish is applied elsewhere, "I sub out all the finish work we do. The man who does it uses Kem-Var (a Sherwin–Williams product). It's a hard and durable finish and it will never crack."

The rosewood bars are not stained, but they do receive the same Kem-Var™ finish that the frames get. Turnaround time for the finish work is fast—two or three days. It takes about three hours to assemble a completed marimba, once the frame and bars are brought back to the shop.

Another distinctive feature about Samuels' instruments is absence of unwanted vibrations from metal contacts.

"On older marimbas," says Samuels, "you can sometimes hear buzzing. That's because there are hundreds of metal to metal contacts. I wanted to eliminate that."

To eliminate the buzz, Samuels came up with the innovative idea of putting a thin, 1⁄16" layer of felt on the straps that bolt to the resonators.

"I tracked down a company who has felt with a pressure adhesive backing on it. I can get it in the width I need, then we cut it to length, peel off the paper and press it on."

Attending to details like this explains Samuels' growing reputation for building the finest marimbas on the market today. He's earned the reputation for making quality musical instruments that are played in concert halls around the world.

The concert range marimbas are owned by universities, symphony orchestras (like the San Francisco Symphony) and professional musicians.

Well known percussionists and musicians like Evelyn Glennie, Nancy Zeltsman and Neil Young are among those who have rented or purchased his marimbas.

When Samuels first started, he was making only one or two marimbas a year. In 1992 he made 27 marimbas, and he completed 40 marimbas in 1993.

Thirty–five year old Samuels operates his business, Marimba One, from a shop behind his rural country home in northern Humboldt County, California. Most of his orders are through word of mouth advertising. The woodworking business provides Ron and his family, and eight fellow marimba builders, a modest income and sound employment. PW

Using the Tormek Grinder

Before we can even begin a discussion of this issue's tool, a tool sharpening grinder, it may be worth making some general observations about grinding and honing. It almost goes without saying that sharp tools work better than dull ones. It's equally true that we're less likely to get hurt with sharp tools. The most important thing any of us can do to improve our sharpening skills is to practice on tools we don't much care about until we've mastered the skill, and then continue to sharpen your own tools on a regular basis. It may take hours to get all the tools in your shop sharp, but it should only take a few minutes per day to keep them that way. Here's another reason to sharpen often: Sharpening skill belongs in your muscle memory, not just your intellect. Only practice makes perfect. Knowing in your mind how to sharpen is not the viable skill that being able to sharpen is.

I first saw the Tormek grinder at the 1993 National Hardware Show in Chicago. It was being demonstrated by a gentleman in a silk suit. I mention the silk suit because it helps to demonstrate that the Tormek sharpening system is neither as dirty as dry grinding nor as moist as higher speed wet grinding. Here, finally, is sharpening without a mess and without burning tools. Additionally, the Tormek lets you go straight to work without having to do a great deal of setting up. With all wet grinders, you get one important advantage: the tool is cold running, so you'll never overheat the steel in the cutting edge. The Tormek is a wet grinding system that's as much an improvement over standard wet grinders as many of us believe those standard wet grinders are over the usual $39 hardware store dry grinders.

One reason the Tormek is better is the wide range of jigs. They make it possible for even an amateur at sharpening or a sharpening–phobic like myself to successfully put a honed razor–edge on tools of almost any shape. There's no risk of accidentally burning the edge and drawing the temper from the steel or of grinding the tool at other than the exact angle that you select. Another advantage is its great instruction manual, one of the best I have seen.

The machine doesn't have to be attached to the work bench to remain steady when grinding because of the rubber feet attached to the bottom of the steel housing. The grinding position ensures a downward force that stabilizes the machine. You can easily turn the Tormek around for honing or for grinding in the opposite direction. There is a carrying handle which makes the machine easy to move and helps to save space in a small workshop. (The Tormek should not be carried by the universal support at any time.) A removable water trough does away with dragging the grinder to the sink for emptying.

***Hugh Foster** is a noted woodworking writer and a Contributing Editor to* Popular Woodworking. *Hugh lives with his wife in Manitowoc, Wisconsin.*

Setting the proper grinding angle with the AngleMaster.

The diamond impregnated truing guide brings the wheel back to square.

Use the stone grader to change the grit of the grinding wheel.

The water trough is removable for easy emptying.

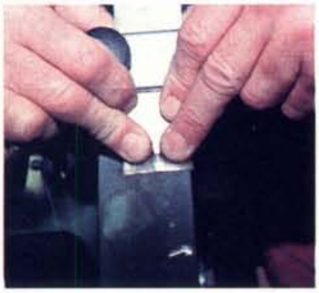
The drive is a continuously rated ¼ hp, 110 volt motor with a unique, quiet running friction drive. It rotates a 10" diameter X 2" SuperGrind aluminum oxide stone and a SuperSharp leather honing wheel at just 90 rpm. The low speed is a significant feature, but there's more. With a grinder like the ScanGrind, there are several different grinding wheels available for use with different kinds of sharpening. With the Tormek, using the SP-650 (flat) stone grader you can change the 220–grit revolving stone to 1000–grit to polish out grinding marks. In this polishing operation, keep the tool stationary to keep the new smaller honing marks from moving side-to-side. Of course, by reversing the stone, you can change the wheel back to the original 220–grit. This process of changing the grit doesn't place undue wear on the grinding wheel. Indeed, Tormek is so confident of the stone's durability that the catalogues don't even list a replacement wheel. What's more, Tormek suggests that you can use the side of the stone to lap a chisel. Grade the side of the wheel for lapping with both sides of the grader stone to remove any bumps and nicks. When you're grading the wheel, you'll have to press hard enough on the grader to almost stop the wheel's circular motion.

After grinding a tool, gently hone away the burr with the Tormek SuperSharp leather honing wheel—it leaves a razor sharp edge on the tool. Use Tormek PA-70 honing compound on the leather wheel to achieve an even finer surface, a highly polished edge. It's important to run the honing wheel away from the edge in order to avoid damage to the leather surface of the wheel.

Realizing that the above description doesn't even begin to suggest the reasons for my enthusiasm for the Tormek grinder, I'll now describe the Tormek package, grinding a tool with the standard jig, then describe the other useful jigs which are available as accessories to the grinder.

Each machine is packed with the straight edge grinding jig, an AngleMaster, honing compound, and an owner's handbook, which will enable you to start work immediately. The folks at Tormek aren't kidding when they suggest theirs is the most advanced grinding system available for woodworkers. It performs a variety of grinding tasks to a very high

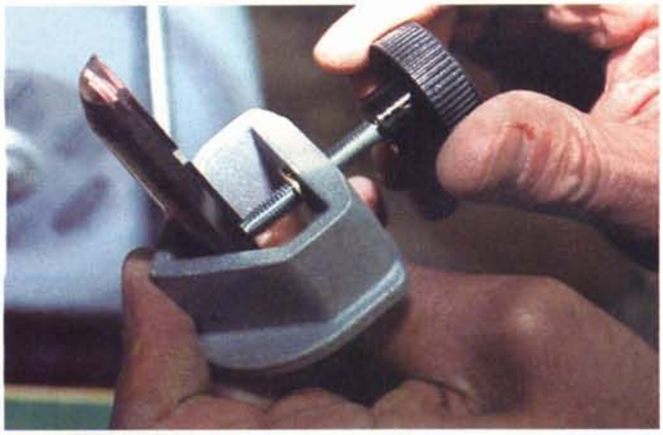
The side of the stone can be used to lap the bottom of a chisel.



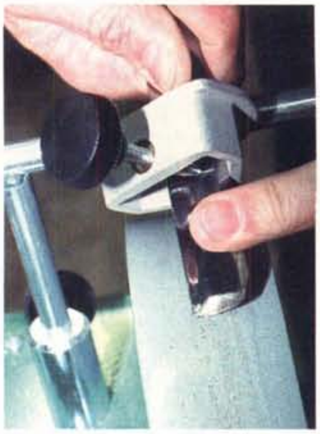
The proper grip for grinding a chisel applies even pressure on the blade.

Honing a chisel on the leather wheel removes burrs and polishes the edge.

Even narrow gouges can be easily ground with this jig.



Setting up a gouge in the grinding jig ensures an even, accurate edge.



Grinding a gouge it as simple as keeping the jig against the support.

Honing a gouge on the edge of the wheel is possible.

standard, so even at its retail price of around $369, it represents good value.

All the jigs operate with the grinding wheel turning toward the edge, which is common for a grindstone. Though the design of the Tormek machine is such that it may be turned around to grind in the opposite direction at will, grinding toward the edge increases the grinding pressure and results in shorter grinding times. Tormek's SuperGrind wheel grinds so quickly that even very deep notches can be removed in 30 seconds or so. Grinding towards the edge also reduces the risk of the stone becoming clogged, and the burr that develops during grinding is easier to remove.

The height of the universal support sets the edge angle. You can select the correct angle for the tool with the Tormek AngleMaster or by eye. After you tighten the tool into the holder start with the universal tool post set high, then tap it down into place.

The SVH-60 standard jig is a dandy, similar in many respects to the excellent jigs provided by Veritas and Highland Hardware. To ensure even grinding and wear on the stone, move the tools from side to side. You can remove the tool during grinding to check your progress and whether you're grinding evenly. When the tool is returned to the stone you can be certain that it is at exactly the same angle as the previous setting. With a very short blade, use a straight edge where the blade meets the stone—this also works for blades with non–parallel edges.

By the time you know enough about grinding to want a machine like this, you'll probably want most of the accessory jigs. You'll find that the excellent and very quick results the machine provides encourages you to experiment with edges that you wouldn't otherwise consider sharpening in your own shop. It will cause you to work with sharper tools than most of us have used in the past.

You won't have to square up the wheel very often if you work across it rather than always in one position. Note the set up must be perfectly flat for sharpening electric planer knives. The ADV-50D diamond impregnated wheel truing device helps to keep the stone true to perfect roundness and an absolutely flat grinding surface. To re–true the wheel, drop the diamond cutter into the lowest point on the stone; then it will cut across the stone making it perfectly flat and round. You shouldn't have to do this too often, but you may want to at least check for flatness before you sharpen electric planer knives with the SVH-320 jig.

The SVS-40 gouge grinding jig works with carpenter gouges, carving gouges, and turning gouges. The jig works with very small tools as well as with very large tools. If you're trying to cut finger nail bevels on turning gouges, move the gouge forward in order to grind the sides. Mount a gouge, then use the back edge of the gouge–gauge against the underside of the wheel.

Grind gouges more on the edges to keep from removing too much of the center as you turn the tool over the wheel. With very small gouges, you can grind the point on the gouge jig's locking screw so that it's even finer. Some turning tools can be sharpened well with this jig, but others will work better with the turning tool jig, shown above.

The turning tool jig SVD-110 helps you to achieve a perfectly sharp edge in seconds on parting tools, scrapers, and skew chisels (curved or straight). The surface of this jig measures 3½" X 4¼", and permits easy and steady holding of the tool toward the grinding wheel. This angle of the jig can be set and locked in a second. The turning tool jig fits onto the universal support with Torlock power locking; the bore is made with a special wedge shape, which increases the locking pressure by as much as 250%; you won't need a wrench—just turn the knob and the jig is safely and instantly locked at the chosen angle. Keep the tool's back flat to the jig to hold your angle. A turner can come straight off the lathe without having to "jig up" unless changing the tool profile. For turning skew chisels, either hold at the correct skew angle or use the chisel jig.

The SVH-320 jig for *electric planer* blades will be a godsend for those who can't find someone to do affordable professional grinding. It will grind blades up to 12½" long with a single pass. The minimum width is ⅝". The jig provides very precise control on the amount of material removed, so it helps ensure that the blades will be balanced. There is no limit on the length of the planer blade you can sharpen. Set the maximum width of grind with the hex–key to keep from going over the edge. The maximum width of pass is 13¼", but a 24" blade can be ground in two passes, 36" blades in

Each planer or jointer blade is ground exactly the same with this jig.

The turning tool grinding jig provides a stable surface to rotate large gouges.

The standard jig is the one to use to grind a turning skew.

three passes, and so on. Micro–adjusters set both height and bevel angle. It's a good idea to color the bevel of the cutter with a magic marker so you can be sure that you're taking a uniform amount of material. The grinder will stop grinding when it's done. You then put in the second blade and have a pair or trio of blades all ground identically. Keep the blade in the blade holder to polish the bevel on the leather wheel.

The axe jig, SVA-170 is suitable for hand or felling axe blades up to 6" in length. The height of the universal support determines the edge angle. Press your palm on the axe close against the back stop in the jig and the grinding takes place. You can follow the shape of the axe edge during grinding by raising or lowering the handle. Neither of my two axes fit the jig very well. Since the axes are essentially "normal," I suspect that, unlike the other accessories, this fixture may be less than ideal for most axe sharpeners; saving the price of the jig may be worthwhile in this instance. Freehand sharpening on the universal support appears to be the way to go in this instance.

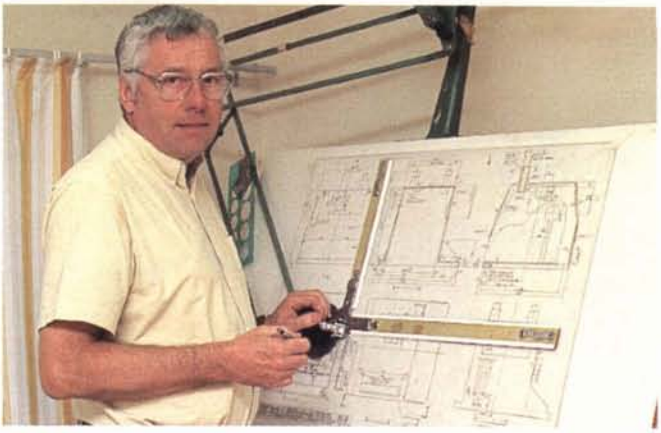
There are two jigs for grinding knives. The SVM-45 is suitable for most knives, and the SVM-100 is designed for longer, thinner knives with a minimum length of five inches. These jigs are suitable for shop knives, carving knives, and kitchen knives, as well as carpenter's draw knives. The knife is fixed into the jig and the edge angle is determined according to the application. The AngleMaster can be used to set the angle to either 25° or 40°. In this jig, the grinding angle adjustment is actually in the handle. First, you turn the handle to zero in the middle of the setting range. Next, set the universal support by eye to the desired edge angle, then turn the handle clockwise for a larger angle or counter–clockwise for smaller angles.

Grind one side of the knife until you achieve an even travel and can feel the burr along the entire edge—then grind the other side in the same way. Once you have finished, move to the leather honing wheel and gently remove the burr and polish the edge to a razor sharpness. The regular knife jig can be used for nearly any knife other than one with a long flexible blade—there's another fixture for sharpening them. Now there's no excuse for having dull knives in the kitchen.

The SVX-150 grinding jig for scissors is terrific for household and garden scissors. Set the angle by using the AngleMaster; this two part jig holds each side of the scissors at the correct angle. The scissors cut the burr off the blades by themselves.

Tormek U.S.A.'s office is at 14205 W. Wisconsin Avenue, Elm Grove, WI 53122; telephone 414-797-8959. The machine is available from Garrett Wade, Whole Earth Access, Woodcraft Supply, and other fine tool suppliers.

Again, the tools are not inexpensive, but I'm confident that this is a sharpening system that will keep you from having to shop again for a "better" model. PW

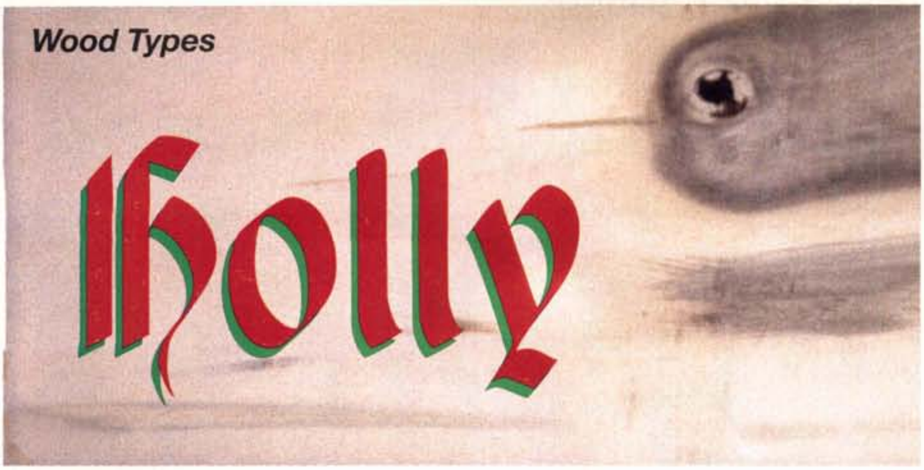


Mr. Torgny Jansson, President of Tormek, at his drafting board in Sweden.

Price List

Tormek 2000 Grinder	$369.95
SP-650 Stone Grader	$17.95
PA-70 Honing Compound	$5.95
ADV-50D Diamond Stone Truing Device	$56.95
SV-40 Gouge Grinding Jig	$12.50
SVD-110 Turning Tool Jig	new: not in the catalogue
SVH-320 Planer Blade Jig	$124.95
SVA-170 Axe Jig	$10.50
SVM-45 Short Knife Jig	$26.50
SVM-100 Long Knife Jig	$37.95
SVX-150 Scissors Jig	$35.00

Wood Types



Holly

As woodworkers begin the intensive gift–making season, here's a wood worth considering for a project. With its long standing association with the holiday season, holly can be both a practical and a seasonally–correct wood to use.

General Description

American holly (*ilex opaca*) is just one of nearly 300 species of holly trees and shrubs found around the world. But it is unlikely woodworkers will get lumber or veneer from anything but American holly. It is the largest and most widely distributed of the hollies in North America.

Found in colonial times in the Piedmont area of the Southeastern United States, American holly has been moving slowly north and west. It can now be found as far north as Pennsylvania and southern New England and as far west as the Ozarks. Birds carrying seeds are thought to be responsible for its spread.

The American holly tree prefers rich bottom lands with lots of moisture; although they can thrive in gravelly soils in the north. They are rarely found in pure stands, generally growing individually in the shadows of larger trees. They are relatively scarce and grow to only about 60 feet, taking up to 150 years to reach such heights. They generally grow straight with the trunk only reaching two feet in diameter. Their evergreen, spiked leaves and bright red berries make them easy to identify in the forest. It's the state tree of Delaware.

The wood of American holly is unique. In good specimens. it is nearly pure white, with no figure or annular rings to break up its uniformity. There can, however, be some darkening, even some dark gray or gray–brown streaking, in lumber that failed to reach the sawmill immediately after felling. There can also be some hints of grain where knots and other imperfections forced the tree to grow around a blemish. The wood is very prone to rotting and the gray streaking is the first sign of it. The darkening is likely to appear first in the heartwood. American holly wood is otherwise dense, moderately heavy and moderately hard.

Common uses of American holly are very limited due to the small supply of the lumber. However, it is used for decorative inlays, small parts for musical instruments, keys for pianos and organs, brush backs, engraving blocks and decorative pieces in fine indoor furniture.

Working Properties

Holly is easy to work when you get good lumber. But since it's hard to get a lot of straight–grained, blemish–free boards, a few extra steps may be required for good results.

Planing either by hand or machine usually yields good results. Since it's not a particularly hard wood, holly allows you to take off an eighth of an inch on each run through a planer. But if there are blemishes, the twisted grain around these spots will necessitate running the board through slowly, taking off as little as a 1/32" per pass. Otherwise, you get gouging, chipping and raised grain.

Sanding is easier than planing. The wood's moderate hardness prevents sanding dips and burning is rare. Boring, cross–cutting and ripping are all problem–free, regardless of the quality of the wood. Routing, however, is identical to planing in the problems it presents.

Working holly on the lathe requires some extra care and time. Again, without all perfectly straight–grained lumber, grain variations can yield fairly rough surfaces. Compared to something like Honduras rosewood (*PW* #78), a lot of sanding may be required. All operations produce an average amount of dust, prompting occasional allergic reactions, mostly sneezing. When worked, holly smells like old newspapers.

Holly holds fastenings moderately well, slightly better than hard softwoods like cypress (PW #74), but not as well as as hardwoods like hackberry (*PW* #69). It is, however, very good at resisting splitting. Without drilling pilot holes, I was able to drive #8 drywall screws into the ends of boards without any splitting. For bigger screws, or nails larger than 10d, you should drill a pilot hole.

***Ken Textor** works wood and writes about it in Arrowsic, Maine.*

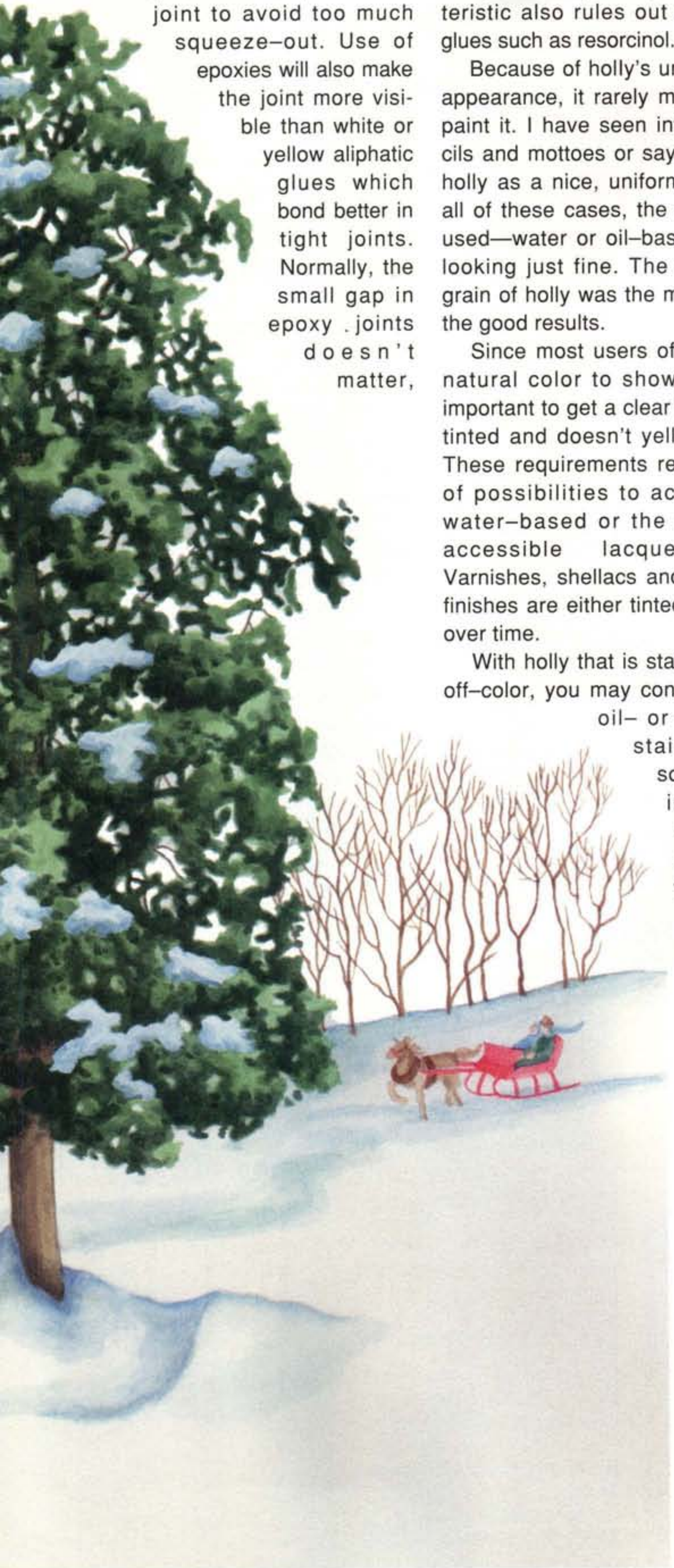
All gluing procedures were problem free, but you should avoid epoxies because they need a little space in the joint to avoid too much squeeze–out. Use of epoxies will also make the joint more visible than white or yellow aliphatic glues which bond better in tight joints. Normally, the small gap in epoxy joints doesn't matter, but with holly's uniform white color, the gap will be more noticeable than when using white or yellow glue. This characteristic also rules out other colored glues such as resorcinol.

Because of holly's unique all–white appearance, it rarely makes sense to paint it. I have seen interesting stencils and mottoes or sayings that used holly as a nice, uniform backdrop. In all of these cases, the paint that was used—water or oil–based—came out looking just fine. The tightly closed grain of holly was the main reason for the good results.

Since most users of holly want its natural color to show through, it's important to get a clear finish that isn't tinted and doesn't yellow over time. These requirements reduce the field of possibilities to acrylics, either water–based or the more readily accessible lacquer acrylics. Varnishes, shellacs and polyurethane finishes are either tinted or will yellow over time.

With holly that is stained or slightly off–color, you may consider using an oil– or water–based stain to regain some uniformity in the wood. I found the natural stains in the wood tended to disappear when painted stains were applied.

Finally, if you're going for that clean, all–white color, don't handle the piece much after the last sanding. Even clean hands will leave a slightly noticeable oil stain on the wood's unfinished surface.



Availability

Finding holly lumber will probably be a challenge, even at the few suppliers that do advertise. Wholesale supplies to retailers are erratic, primarily because few loggers bother to separate for the saw mill such a rare specimen as American holly. There are also so few worthwhile holly trees in the first place. Thus the price for holly lumber is usually in the range of $6 to $10 per board foot.

Understandably, a lot of holly is cut into veneer. In this form it is more widely available from most veneer dealers. The cost for veneer is about a $1.50 to $3 per square foot. The quality in veneers is also much better than lumber. Knots and black streaking are easier to eliminate from veneers and they are usually very uniformly white.

Because of the relatively small size of the tree, there is no dimensional stock in holly. Nor is there holly plywood. Indeed, just getting three–quarter stock from lumber dealers is difficult enough. Very often, the best a sawmill can get out of a holly log is a small stack of ½" planks.

Still, holly has so many associations with the holiday season, woodworkers may feel divinely inspired to keep just a little of it around the shop. After all, the words holy and holly are thought to have sprung from the same root. PW

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#79 July 1994 $4.50

Display Trays, The Art of Pipe Making, Coffee Table, Three Small Boats, Vanity Stool, Cartridge Box, Chip Carving, Inverted Orbital Pad Sander, *Specialty Sanders*, Osage Orange

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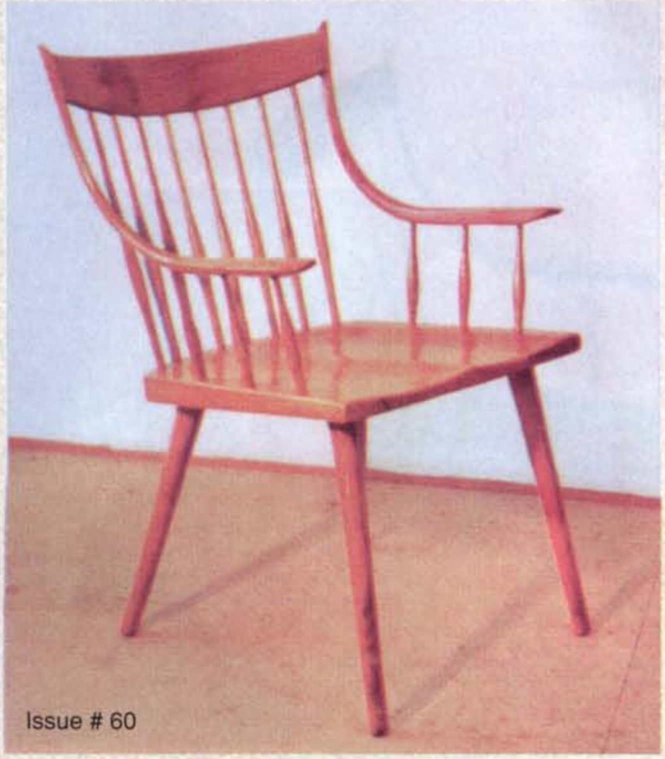
Turned Spice Canister, Cedar Blanket Chest, Tambour Wall Desk, Woodworker's V–Block, Contemporary Desk, Nail Storage Cabinet, Nautical Flower Box, Carving, *Finish Nailers*, Honduras Rosewood



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#77 March 1994 $4.50

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Loft A Duck, A Simple Cabinet, Making Pine Burl Tables, Colonial Handkerchief Table, Puzzle Chair, Fairy Tale Birdhouse, Making Bow Saws, Toddler's Toybox, Relief Carving, Dashing Dan (whirligig), CD Storage Case, *38" Corded Drills*, Mesquite

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Horse Push Toy, Crown Moulding Jewelry Box, Secretary Desk, Salmon Wall Plaque, 4–Jaw Chuck, Sewing Cabinet, Wooden Bar Clamps, Folding Step/Chair, Locking Musical Bank, *Readers' Choice Winners,* Sycamore

#70 January 1993 $4.50

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by Bill Houghton

Danger!
Children in the Shop...

Should children be allowed in the shop? Some people say they should learn how to use tools while they're young. Others worry that the shop is too dangerous, citing cases of children falling on sharp tools, distracting their parents at critical moments and causing injuries and being swallowed up by thickness planers.

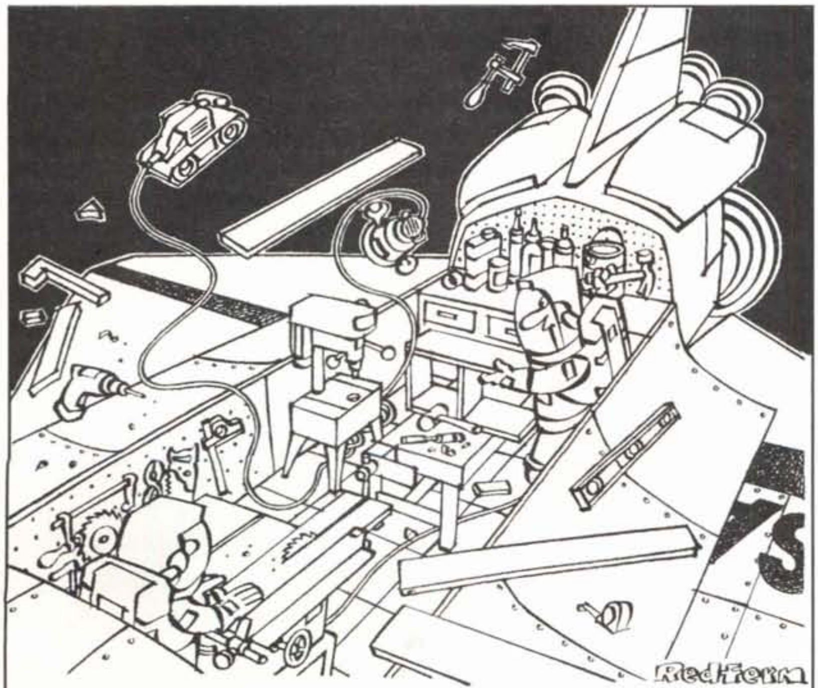
I've spent 22 years raising two sons, both of whom spent plenty of time in the shop, and I've got a firm opinion that it is very dangerous for children to be in the shop. Not to them—they're young, and the occasional cut or scrape heals quickly—but to you.

It starts so innocently. You really enjoy the time before each project, gathering scraps of pine and suitable tools, so they can whip together their little boats. Before long, you're interrupting work to help them through the tough parts of their more elaborate creations. Then suddenly, some project of theirs is being glued up all over your bench and half the floor. They use up every clamp you own and drip glue all over your router.

Becoming a displaced shop owner isn't the only hazard you face when you let children into the shop. The years you've spent accumulating your stock of tools—garage sales, broad hints before birthdays, carefully saved "fun money"—all this can be undone in a few short months. You'll hear things like, "Gee Dad, I don't know where your chisels are." Later, you may find them under their beds or somewhere in the backyard, with edges that resemble the peaks of the Rocky Mountains. For some reason in my shop, Phillips screwdrivers are like Corvettes on the streets of Los Angeles—gone in 30 seconds. Eventually, I'll be reduced to working with a putty knife and a cheese grater.

If you scrounge your wood here and there and cling to every figured piece of hardwood, saving it for the projects you've got in mind as soon as you finish remodeling the house in the year 2000—I say, if you are like most of us shop rats, beware! Your wood stash is endangered from the minute you let the little termites in. The day will come when you'll be expected, like the good parent you are, to smile through your tears, praising the bookend your child has made from the very center of the quilted mahogany board you've been saving to make a coffee table.

Bill Houghton *is a hobbiest, raised in a generation where the ability to analyze and fix anything was a sign of adulthood. He lives in Sebastopol, California, where he's a personnel manager.*



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It is true—I'll admit it—that you will feel a warm glow as you look at your children's work, knowing that they will grow up into competent, confident adults who can build things for themselves. But this glow comes at a price, all too often, it turns into a white heat, as you realize that your tools, your supplies, and the peace of mind you sought by puttering in the shop are threatened by these seeming innocents, children.

Actually, when I calm down, which takes about half an hour to an hour, depending on how fond I was of the wood or tools in question, I'm truly proud of my sons. Their handiwork is visible all over the house, from the key holder Michael routed, sanded, stained, and installed in the kitchen, to the wooden fence Muir recently finished in the side yard. Every minute of frustration suffered over the years disappears in this pride.

So take them into the shop. Teach them safety and good tool use. Put up with misplaced tools, used up supplies, and incredible messes on the bench. What you build will last longer than any of your other projects. PW

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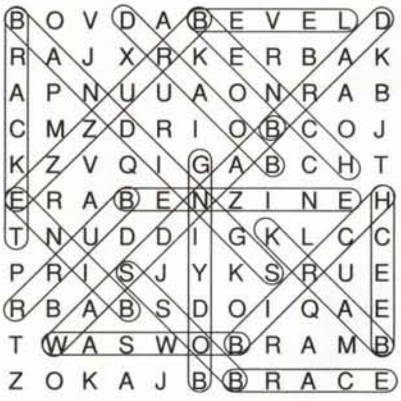

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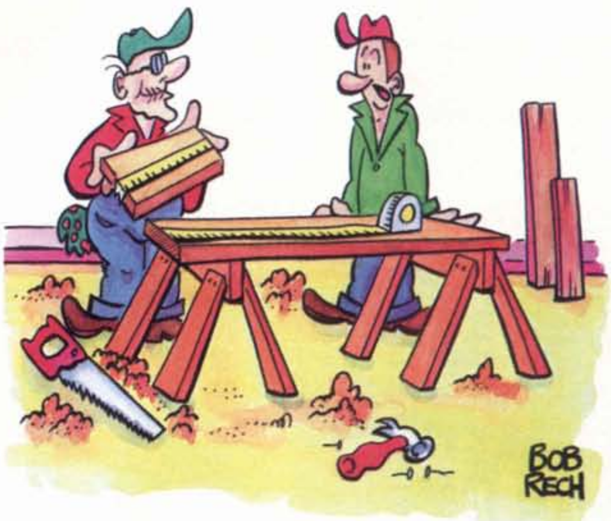
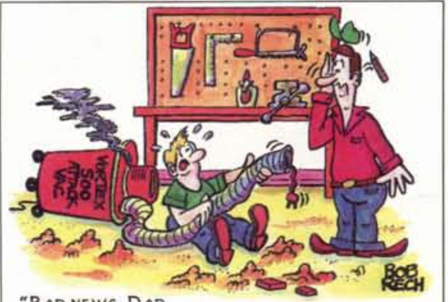
The two runners up receive a one year subscription to *Popular Woodworking*. The winner receives the new Skil 8" Drill Press, model 3380. Features include: 1/4 HP induction motor, 5 speeds (620-3100 rpm), adjustable depth stop, 1/2" chuck with 2" spindle travel and 7" chuck to table clearance—10" to the base. There's a conveniently located chuck key holder and a drill bit storage compartment for 20 bits (1/64"–1/2"). The warranty is for 2 years.





"BAD NEWS, DAD...
YOUR NEW HOLD–DOWN CLAMPS DON'T WORK!"

AND THE WINNER IS...

The winner of our "Caption The Cartoon Contest #7" in the March, 1994 issue, and recipient of the Skil 3380 8" Drill Press shown here is:

Jake Hannam, from Laurel, Maryland

The runners up receive a one year subscription to *Popular Woodworking*.

Myla Pounds, from Corona, New Mexico

"THESE NEW ALUMINUM ALLOY TABLE SAWS ARE SURE LIGHT, AREN'T THEY?"

Bill Stanbra, from Saint Therese, Quebec

"I JUST WANTED TO CLEAN THE SAWDUST OFF HIS CAP!"

Calendar

Events of Interest to Woodworkers

If your group is having an event you would like other woodworkers to hear about, please send us all pertinent information at least four months before the opening date. Space permitting, we'll publish it for you here in our Calendar section free of charge. *Popular Woodworking*, Calendar, 1507 Dana Ave., Cincinnati, OH 45207.

California

Building the Norwegian Sailing Pram: (10/10–15/94) With Simon Watts the emphasis is on learning to use hand tools with speed and accuracy.

Contact: National Maritime Museum Association, Building 275, Crissy Field, San Francisco, CA 94129, Tel. 415-929-0202.

Massachusetts

Eastern States Craft Festival: (10/22–23/94) Eastern States Exposition, West Springfield, MA.

Contact: United Crafts Enterprises,Ltd., Box 326, Masonville, New York, 13804 Tel. Stan Rabbiner 607-265-3230 or Donald Allen 607-748-5224.

Worcester Center for Crafts: (11/25-27/94) 12th Annual Festival of Crafts.

Contact: The Registrar, 25 Sagmore Road, Worcester, MA 01605, Tel. 508-753-8183.

Tool Making for Woodworkers: The first three weekends of each month.

Contact: Ray Larsen, Genuine Forgery, Inc., 1126 Broadway, Hanover, MA 02339, Tel. 617-826-8931.

Minnesota

Classes/Workshops/Demo's: (year round) Information, manuals and hands–on. Instruction for beginners to advanced, hobbiest to business. Minneapolis/St. Paul area.

Contact: Wild Earth Woodworking, 401 Hunter Hill Road, #3, Hudson, WI 54016. Tel. 715-386-3186.

Conover Workshops: (10/94) Handplane, finishing, bowl turning, English clock, machine joinery, routers, chip carving, woodturning tools and more.

Contact: Conover Workshops, 18125 Madison Rd., P.O. Box 679, Parkman, OH 44080, Tel. 216-548-3491.

Texas

Rio Grande Valley Woodcarvers Show: (1/20-21/95) Civic Center, McAllen, Texas.

Contact: Dorothy Chapapas, RR 2, Box 150, McAllen, TX 78504, Tel. 210-581-2448.

Tennessee

"Woodturning: A Tribute to the Osolniks": (10/20–22/94) Arrowmont School of the Arts and Crafts.

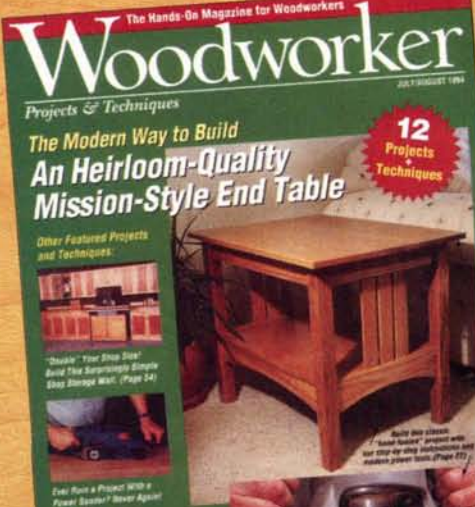
Contact: Sandra Blain, Director, Arrowmont School, PO Box 567, Gatlinberg, TN 37738, Tel. 615-436-5860.

Wisconsin

International Lathe–turned Objects: (11/5/94–1/8/95) Featuring sixty–seven objects by fifty–three artists from seven countries selected from the Challenge V competition sponsored by the Wood Turning Center of Philadelphia.

Contact: Marcia M. Theel, Public Relations Coordinator, Leigh Yawkey Woodson Art Meseum, 700 N. 12th St., Wausau, WI 54403, Tel. 715-845-7010.

Give The Gift That's Made To Last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BLAZING NEW TRAILS THROUGH THE WOODS WAS NEVER EASIER.

Much of the thrill of woodworking can be found in the exhilarating challenge of a project you've never explored before.

Of course, ideally, the challenge should be to your abilities, *not* your tools. Particularly not your band saw. No tool plays a more critical role throughout a woodland adventure.

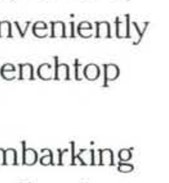
Which is why you should make your journey with the Skil HD 3640 band saw.

Its 1/2 hp, 6.0 amp induction motor lets you enter the thickest woods with confidence. The throat capacity is a generous 10" deep. And the cutting height can handle up to 7" of stock.

Putting teeth into these specs is a blade range of 1/2" wide for resawing to 1/8" wide for scrolling.

The HD 3640 has a lightweight, single piece cast aluminum frame that's computer optimized for strength and stability. What's more, its two-wheel blade drive system lowers vibration, improves tracking and helps blades last longer.

And when blade changes *are* needed, the hinged cover swings open 180° for easy access at the flick of its snap-fit latches.



Perhaps the most impressive thing about the HD 3640 is how it packs stationary band saw performance into a 36" high benchtop model. Which, in turn, allows it to be conveniently packed *under* a benchtop when not in use.

So, before embarking on your next woodland adventure, make sure you're properly equipped. Blaze a trail to a store that carries the HD 3640 band saw and the other Skil Woodshop tools. You'll be glad you made the trip.

SKIL WOODSHOP TOOLS

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When it comes to intricate sanding jobs, nothing beats the new Ryobi Detail Sander 2000. With its small, lightweight body and unique triangular head, the dual-speed Detail Sander 2000 gives you the power and finesse to conquer even the most forbidding nook, cranny or corner. Just think. No more finger sanding. No more headaches.

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The new Ryobi Detail Sander 2000. You might say it's the best thing to happen to woodworking since, well, the original Ryobi Detail Sander.

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